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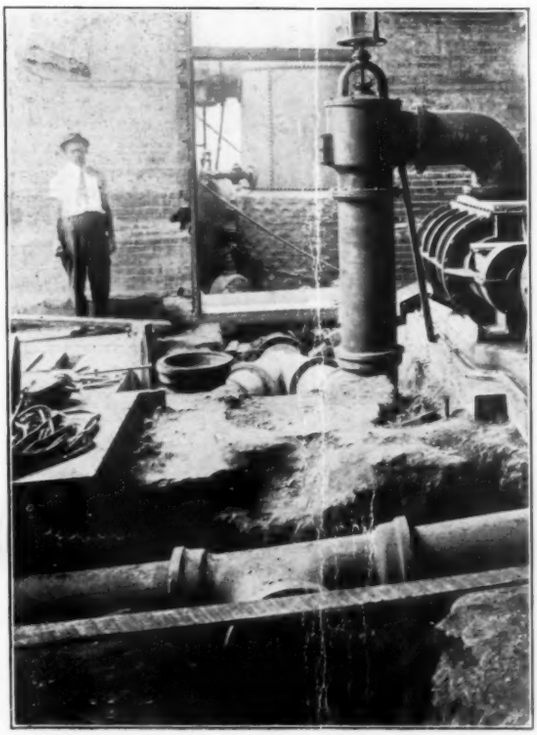

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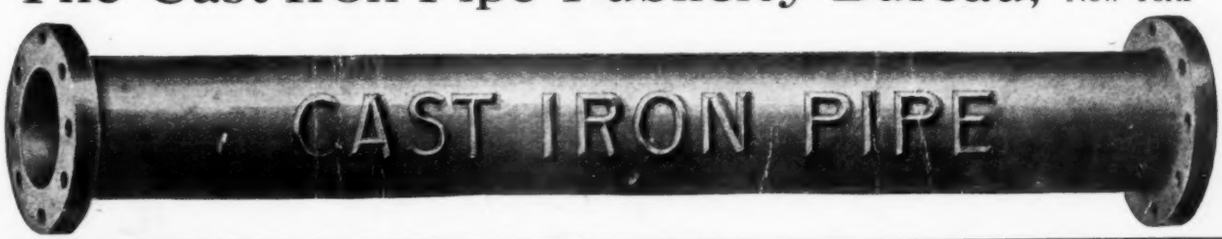

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Vol. CVII, No. 26 NEW YORK, DECEMBER 29, 1917 Whole No. 3121

A Mistake to Install Gas in Old Bakers' Ovens Which Do Not Work Satisfactorily with Coal

Gas Will Heat a Good Oven Better than Coal, but Will Not Stop Cracks which Allow Heat to Escape or Hold Up an Arch which is About to Fall Down — Additional Advantages of Gas for Baking — Gas Burned Two Hours in Afternoon in One Installation Provides for Day's Baking

By WILLIAM J. HARRIS, Jr.

Engineering Department, Surface Combustion Company, Long Island City, N. Y.

EDITOR'S NOTE: *The overwhelming advantages of gas as a fuel for bakers' ovens, even under existing conditions, without the added advantage of high coal costs and the difficulties of obtaining raw fuels, give reason for confidence that practically all of this class of business in the country can be converted to gas at any time the gas industry as a whole should desire to put it on its lines.*

Here is a big industrial fuel business right within our hands. Subsequent improvements, which are inevitable, and sanitary legislation throughout the land will insure the permanence of this business once it is gotten.

The AMERICAN GAS ENGINEERING JOURNAL *is convinced that too much information on this important subject cannot be furnished to the gas man. He has need of all that is available.*

Successful gas installations have not by any means been confined to one class of equipment alone. In the Nov. 27, 1916, issue of the AMERICAN GAS LIGHT JOURNAL, *Henry L. Read described a successful conversion of brick bake ovens from coal to gas by means of surface combustion equipment. This article in itself was significant as to the future of gas in this particular class of work. This was followed by the publication of an article on a similar subject by Bruno Rahn in the Sept. 15, 1917, issue of the* AMERICAN GAS ENGINEERING JOURNAL, *in which a strikingly successful type of installation employing a radically different equipment was described. The present article describes a type of installation using surface combustion equipment, but revealing new features of design and arrangement, the fruit of experience gained under actual operating conditions.*

The bake-oven field lies ready for broad development by the gas industry. That the opportunity thus presented will be enthusiastically seized once we have freed ourselves from the false perspective many of us have developed due to war-time conditions, with the consequent coal shortage difficulties, etc., is as certain as day and night. The JOURNAL, *therefore, feels especially gratified over the fact that it has been able to bring to the field information of such a varied nature on this one subject.*

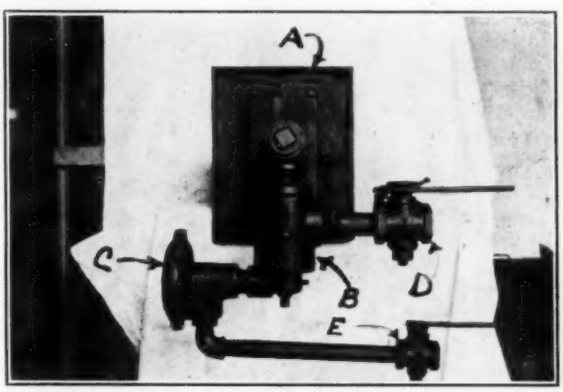


FIG. 1—DESIGN OF BURNER EQUIPMENT

The application of gas to the heating of bakers' ovens seems to be a subject of such widespread interest that some information regarding recent experience with surface combustion for this purpose should not be amiss.

The type of oven referred to is that in which the usual coke or anthracite coal fire is placed directly in the baking chamber. The inside dimensions vary from about 6 ft. x 8 ft. to 12 ft. x 14 ft. and 16 in. to 18 in. high, from floor to roof. The fire grate is usually placed at one of the front corners of the chamber and level with the floor of the oven. A separate fire door is sometimes provided, but more often the firing is done through the regular baking door.

Two General Types of Construction

There are two general styles of construction used in building these ovens. First, the all-brick type, which has very thick walls of firebrick with a facing of red or enameled brick, and which is almost as permanent as the building in which it is located. Second, the so-called portable type with a steel or iron framework and casing. In this case the lining is made of large firebrick tiles, and there is at least 6 or 8 in. of ashes, sand, or other insulating material between the brick and the casing.

This latter type of oven seems to be more economical in the use of gas than the former, probably because of the insulation, which is of great benefit in retaining the heat.

Attention should here be called to the mistake frequently made of installing gas in old ovens, which do not work satisfactorily with coal. This is generally done with the hope that the old oven will be rejuvenated and the expense of building a new one or making repairs avoided. The gas will heat a good oven as well or better than coal, but it will not stop cracks which allow the heat to escape nor hold up an arch which is about to fall down.

The installation of the gas burners has been described and illustrated in a previous article (American Gas Light Journal, Nov. 27, 1916), and no radical change has been found advisable.

Recent improvements have shown the desirability of using a single burner of larger capacity instead of two smaller ones. It is of the "impact" type with the air-gas mixture playing on a "refractory bed" of broken alundum or carborundum which rests on the floor of the oven.

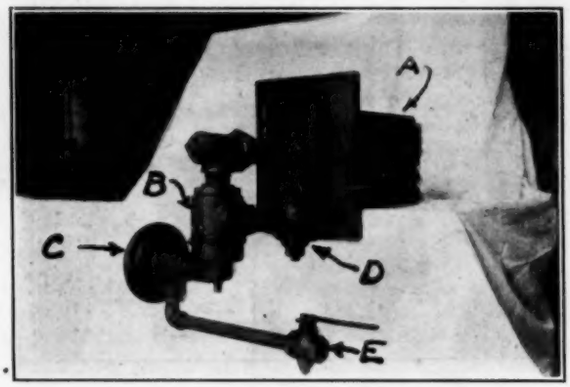


FIG. 2—DETAILS OF BURNER EQUIPMENT

For convenience in placing the burner in the oven the former is bricked up in a cast-iron casing which is inserted in a rectangular opening cut through the front wall. This makes it possible to do the installation work entirely from the outside and thus avoid waiting for the oven to cool.

The burner is supplied with a homogeneous and correctly proportioned mixture of gas and air by the standard automatic proportioning devices used on all equipment of this type.

For one or two ovens the low-pressure system with a positive-pressure air blower is used, but for a large installation the high-pressure system with a gas compressor and one pipe distribution is the ideal arrangement.

FIG. 3—PRINCETON UNIVERSITY INSTALLATION

Fig. 1 and 2 show the latest design of burner equipment. "A" is the cast-iron casing containing the burner, "B" the proportioning inspirator, "C" the gas governor, "D" the air control cock, and "E" the gas cock. The proportioning devices for high-pressure gas are somewhat different from those illustrated, but in either case the temperature control is obtained by adjustment of a single valve.

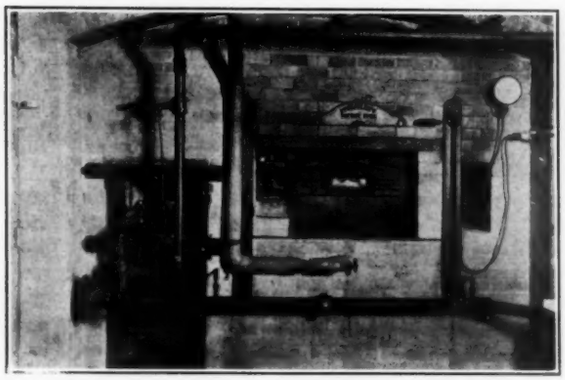
Typical Installations

The other illustrations show some typical installations. Fig. 3 is a view of two ovens at the University Dining Halls, Princeton University. Fig. 4 shows details of the burner arrangement.

These ovens are 8 ft. wide x 9 ft. deep. They are usually heated but once a day, the gas being lighted for about two hours in the afternoon. After turning off the gas they are allowed to "soak" for about a half hour before being used for bread-baking. The next morning, rolls, cakes, pies, etc., are baked without the use of any more gas except that the burners may be lighted for about fifteen minutes to give a little color to the rolls. The gas consumption for the two ovens averages 2,900 cu. ft. per day and the average amount of work per day is as follows:

At 500 to 550 deg. Fahr., 375 loaves bread (1 lb. each),
700 rolls, equivalent to
70 loaves bread.
At 400 deg. Fahr., 60 lb. cakes
At 350 deg. Fahr., 100 pies,
30 gals. custard.

Fig. 5 shows an installation at the J. B. Blood Company, Lynn, Mass. Two ovens have been equipped with gas at this plant with very satisfactory results. The gas consumption per week averages 19,650 cu. ft. for a 10-ft. x 12-ft. oven and 23,380 cu. ft. for a 12-ft. x 14-ft. oven. Operation is twenty-four hours per day, six days per week. The gas is usually lighted twice during the twenty-four hours for a period of one and a half to two hours each time. The usual method is followed of baking bread, rolls, cakes, etc., as the temperature falls. No record of weights of work done has been kept for these ovens, but the head baker states that he is able to get an increased capacity of at least 30 per cent over the coal fires for the following reasons:



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3. As baking continues and the temperature falls too low for satisfactory results, the gas can be lighted with work still in the oven and a good "color" thus satisfactorily obtained.

In fact, this possibility of a "flash" heat is very desirable in any case for small work, such as cookies and small rolls and cakes. It is, of course, impossible with the coal fire, as this cannot be forced with work in the oven, and it does not increase the temperature quickly enough to give the results desired.

A number of equally satisfactory installations have made in Boston, Mass., New York City, N. Y., and Baltimore, Md.

Cost Figures

With gas at 80 cents per 1,000 cu. ft., and anthracite coal at $6.50 per ton, the fuel cost for gas in the same oven usually averages about 50 to 60 per cent more than coal. When the increased capacity and actual saving in labor are considered, this additional cost practically disappears. With coal at $9 or more, the gas may easily be the cheaper fuel without taking the other items into consideration. In addition there are the usual advantages which follow from the use of gas, such as less dirt, less painting, no coal or ash storage or handling, less repairs to the oven and general improvement in the sanitary condition of the bakery in which the installation is made.

Urges Abolishment of Inefficient Watchman Service

Custom of Employing Superannuated Employees for This Purpose Condemned — Watchmen Should be Picked Men

The subject of watchmen opens a big field for consideration, declared W. B. Mallalieu, general manager of the National Board of Fire Underwriters, in an address before the Fire Marshals' Association of America. The prevailing custom among manufacturers, warehousemen and others is that of engaging as night watchman some superannuated employee who is no longer physically able to earn a workman's pay. Such a watchman may make his occasional rounds of clock stations in a purely mechanical way, but the amount of real protection which he furnishes, especially in war-time, is very small. Generally, he can be avoided with ridiculous ease by anyone who is in the place with hostile intent. Or, if not avoided, his overpowering is a matter of little difficulty.

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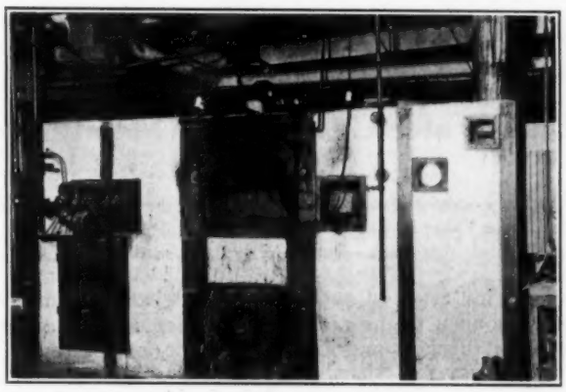

FIG. 5—INSTALLATION AT LYNN, MASS.

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A 900-Ft. Pier with One Watchman

The big Baltimore fire of Oct. 30 is a striking example of insufficient watchman service. Here was a pier, 900 ft. long, containing such a valuable accumulation of freight as 50,000 bales of wood pulp, 150 carloads of flour, 20 cars of tobacco, 30 cars of bark extract, 40 cars of lubricating oil, 25 cars of spelter, 23 cars of roofing paper, 15 cars of miscellaneous freight in the portion of the pier that was destroyed. Pier 9 contained 29,000 bales of wood pulp, 7,000 cases of imported liquor in the bonded end, 300 crates of earthenware, 100 bales of oakum, 100 cars roofing paper, 50 cars of linseed oil cake, 20 cars of tobacco, 23 cars of miscellaneous freight. Think of leaving these stores in the sole

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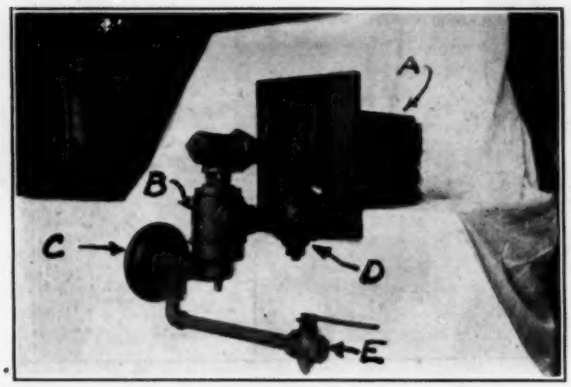

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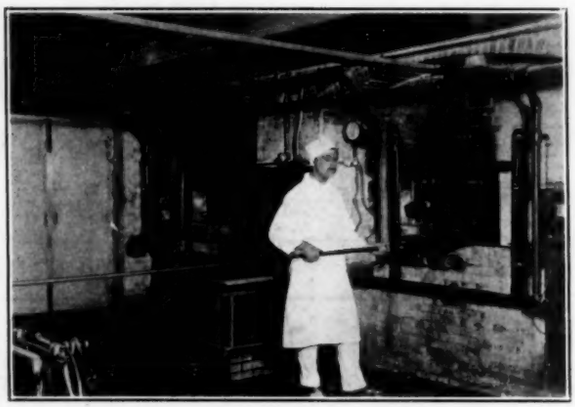

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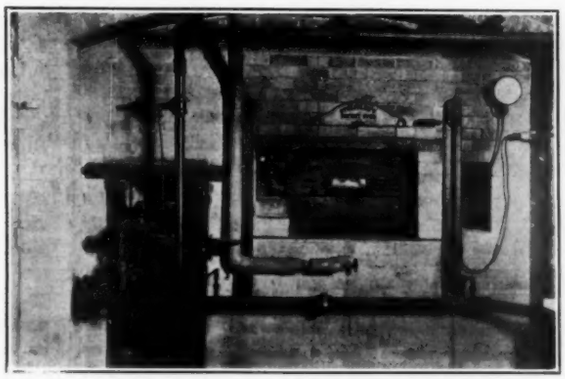

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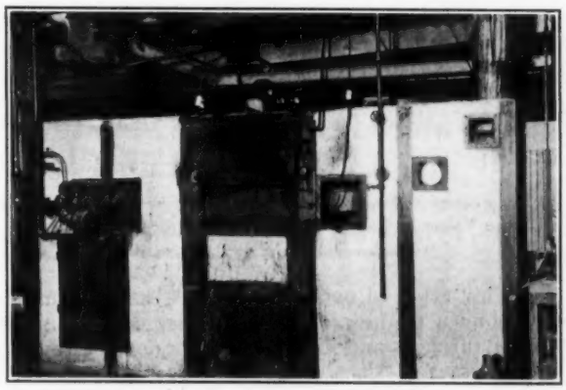

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charge of a single watchman in a time such as the present!

There are really few subjects in fire prevention so important as the abrogation of this time-honored custom of inefficient watchmen. To make the safeguarding of our production of supplies depend upon those who can furnish only nominal safety, during the hours when darkness brings the greatest dangers, and to do this in a period of extensive hostile activities would be ludicrous if it were not so grave. It is equivalent to locking the windows and leaving the front door open.

Picked Men, Not Derelicts

Watchmen are charged with extraordinary responsibility. They should be picked men, not derelicts. They should be intelligent, courageous and physically active. They should be sufficient in numbers to furnish real protection. They should be armed. They should receive special training for their important duties, and this training should include knowledge of fire alarms, fire prevention and fire protection. They should never be engaged except upon unmistakable evidence of character, and they should be paid the salaries that will command such qualifications.

Blue Water Gas Used for Metal Melting in Great Britain

Arthur Forshaw Declares that Generally Speaking Low Calorific Value in Gas for Industrial Uses is Not a Drawback—Rustproofng Cast-Iron

The first types of oven furnace consisted of a row of burners open to the air, the flames from which passed into the furnaces and impinged on the underside of the furnace bottom (usually made of tiles), from thence passing along the tiles towards both sides of the furnace, and so round the edges of the tiles and into the working space, declared Arthur Forshaw, chief chemist for the British firm of John Wright & Company, in a paper presented before the Manchester and District Junior Gas Association. Exit from the working space was by way of flues in the arch of the furnace. The burners were usually natural draught.

These furnaces were not very economical, as there was no direct control of the secondary air. If quicker heating or higher temperatures than those afforded by natural draught were required, air blast burners were substituted, but these were usually enclosed, and were introduced into the sides of the furnace alternately, opposite each other, with each flame directed into its own channel under the tiles. In some cases either natural-draught burners or air-blast burners were introduced into the sides, and the flames entered above the furnace bottom. This was more often the case with air-blast burners.

Advances Made in Control of Secondary Air

Since then, much advance has been made in the direction of the control of the secondary air in natural-draught furnaces, and in that of preheating the air supply—as, for instance, in our regenerating furnaces, where the secondary air is controlled by dampers in front of the furnace, and is preheated by the hot brickwork before reaching the point of combustion. In some foreign-made furnaces considerable efforts have been expended on suitably arranging the oncoming gas and air supplies with reference to the products of combustion or the hot radiating portions of the furnace exterior, in order to get the fullest advantage of recuperation.

It has been found that the gap between natural-draught furnaces on the one hand, and those heated by air-blast on the other, could, with advantage, be filled in, and for many purposes furnaces with air under slight pressure (provided by a fan) have been found satisfactory—thus avoiding the expense of the positive blower necessary for the pressure of 1 to 3 lb. used with air-blast burners.

In our "Lopress" furnace we have developed this idea, and provided at the same time an effective example of recuperation. A novel feature of advantage in this type of furnace is that the gas is introduced by a cock and attached to a large supply pipe. The flame thus produced is a luminous one. At a suitable point, air is introduced from similar jets, and blows the luminous flame forward through flues under the furnace floor, and so into the furnace, as may be most desirable, according to the work that has to be done. The air is supplied to the small jets from a large main or mains round which the products of combustion circulate on their way to the flue outlets. The air pressure required is in the neighborhood of 6 in. water gauge for high temperatures.

"Greasy" Flame Necessary to Prevent Scaling

The particular merits of this type are that it heats up more rapidly than the natural-draught type, and is more economical of gas. It only requires a fan for the air pressure, as against a positive blower for the air-blast type. It has a solid bottom with the flues built in, instead of tiles or slabs, and will consequently stand more hard work. But, most important of all, it enables any quality of flame to be obtained to suit the work in hand. It is the only gas furnace, for instance, where the "greasy" flame so necessary to prevent scaling can be satisfactorily ensured—a flame such as one sees in ovens heated by bituminous slack. This is invaluable in heating work, where scaling is inadmissible or must be reduced to a minimum.

General Design of Oven Furnaces

There are several points about design in oven burners to which I should like to direct your attention. In the heating up of material, the three modes of transference of heat all have their part. Take the case of a flat plate of iron laid on the bottom of the furnace heated by burners under the floor slab. The upper side of it is heated by radiation from the roof or arch and from the walls. It is also heated by the impingement on it of flame or the products of combustion, while the underside is heated by conduction and by radiation from the slab. It will, therefore, be heated rapidly and equally all over.

In the further case of a number of flat plates placed on the top of one another, or a number of bars or tubes

piled up, it is clear that the furnace will require as much bottom heat as possible; otherwise the whole of the material except the top layer must be heated by conduction from that layer, with the result that the top layers are overdone before the bottom layers are more than warm.

For reasons of this sort, there are few cases in which we find it advisable to recommend a furnace having a solid bottom, and heated directly by burners placed in the upper part of the furnace. As a matter of figures, it is possible in a space so heated to attain a given temperature with approximately half as much gas as in one heated below the slab. But mere demonstration advantages such as this are of no actual benefit, because if a furnace is not suitable for the work, the furnace in particular and gas-heating in general quite undeservedly suffer in reputation.

Annealing

Let us now consider for a short time the different operations to which oven furnaces are adapted. First, we will treat of annealing. This is a term sometimes used to express different operations, though usually it means a heat-treatment applied to metals that have been mechanically worked in some way—for instance, hammered, bent, drawn or rolled—or to metals, like steel, that have been hardened by quick cooling from high temperatures. It means heating them up and cooling them slowly through certain critical temperatures. The mechanical working referred to usually gives a product in which there is internal strain of some sort, resulting in inability to stand further stress, or in a tendency to revert to a previous form.

A very good example of this is the production of cartridge cases. The cast ingot is pressed through rolls, which perform the "breaking-down" operation as it is called—the ingot is increased in length and decreased in thickness. After the first rolling, it is still much thicker than is required for blanking. But before anything further may be done to reduce it, the metal must be annealed, otherwise it would crack or break under the next operation. But it must be annealed several times in all before it finally arrives at the correct thickness for blanking—*i. e.*, punching out the blanks from which the individual cases are made. Again, during the drawing processes by which the blank is caused to assume the shape of the finished case, several annealings must be carried out. If the correct number of annealings is not carried out, the finished product is in a state of molecular strain, and the result is it eventually cracks. This last result of the effort on the part of the metal to return to a state of internal equilibrium may not show itself for some months, and is known as "season cracking." We have had experience of cases of it in solid-drawn brass tubes which have been in use for some time, while it has been known to occur in cartridge cases after they have been stored between six and twelve months.

Over-annealing

The importance of the particular temperature at which annealing is performed calls for mention. Some important experimental work has been done by Charpy on brasses, and among them this same alloy—viz., 70/30 brass. In its natural state it has a tensile strength of about 18 tons per square inch. He found that after hammering and rolling sufficiently, this is increased to a maximum of about 32 tons.

The annealing experiments showed that up to about 300 deg. C. there was very little effect on the metal; but above this temperature, and up to 600 deg. C., there was a gradually increased softening. At the latter temperature the tensile strength had dropped to about 17 tons per square inch, after which it remained about constant up to 850 deg. C.; above 900 deg. C. it was over-annealed or burnt.

Usually speaking, the annealing of steel is a very much more interesting subject than that of non-ferrous metals. In order to follow the annealing and heat-treatment generally of steel, some knowledge of its composition, both chemical and structural, is necessary. To give a detailed account of such a subject as the micro-structure of steel would require, however, all the time at my disposal, and therefore cannot be attempted. Still, such a slight idea may be given as will help the changes in steels by heat-treatment to be intelligently followed by those who have not made a study of it.

Steels and Their Properties

Ordinary steels may be roughly defined as alloys of iron and carbon. Steel—that is, iron containing carbon—exists in several different forms, and the heat-treatment of steel is mainly concerned in ensuring that we shall obtain the particular form of alloy that we require. True steel—in which I am not including for the moment the special alloys containing nickel, chromium, tungsten, vanadium, etc., which are also classed under the name steel—can be forged and welded, and all of them can be hardened and tempered by heating and sudden cooling, or softened and toughened by heating and slow cooling.

As the percentage of carbon decreases, so does the property of hardening, and at about 0.2 per cent it is practically nil; while as the carbon increases, the welding property and the forging property decreases, till at 1.2 per cent of carbon steel is not weldable by ordinary shop methods, and at 2 per cent it cannot be forged. The ordinary steels, then contain somewhere between 0.2 and 1.5 per cent of carbon.

Steels Containing Up to 0.9 Per Cent of Carbon

If such steels, containing up to 0.9 per cent of carbon, be slowly cooled after solidification, they exist above 890 deg. C. as practically homogeneous solid solutions of carbon in iron. This form may be rendered permanent by sudden cooling, and is known as martensite. Below 700 deg. C. slowly cooled iron is incapable of retaining carbon in solid solution. The carbon therefore separates out in the form of the carbide of iron (Fe_3C), known as cementite, the iron not used up to form this compound being left pure, and called ferrite.

To make the story complete, ferrite and cementite form a further alloy (21 Fe + Fe_3C), known from its appearance under the microscope as the pearlite eutectoid, which persists in the cold steel. As this eutectoid contains about 0.9 per cent of carbon, it is obvious that a slowly cooled steel containing 0.9 per cent of carbon will consist wholly of pearlite, while below 0.9 per cent

of carbon it will consist of a mixture of ferrite and pearlite, and above this percentage of a mixture of cementite and pearlite. As revealed by the microscope, pearlite consists of a number of thin plates of ferrite and cementite alternating in sandwich fashion. On cooling slowly—between 890 and 700 deg.—changes take place. In steels up to 0.9 per cent of carbon, the whole mass ceases to be a homogeneous solid solution of carbon in iron and gradually separates into a mixture of solid solution and pure iron—the carbon, as seen under the microscope, is found to be concentrated in those parts consisting of solid solution, while the other parts, being pure iron, contain no carbon. To put it in another way, the area of martensite becomes less, while the area of ferrite grows. As the percentage of carbon in the steel as a whole increases, the temperature at which this change starts is lowered, so that with 0.45 per cent of carbon, instead of occurring at 890 deg. it occurs at 760 deg. All the same, when 700 deg. is reached the solid solution of carbon—*i. e.*, martensite—cannot persist, and the carbon, as already described, is separated out as the compound iron carbide (Fe_3C), cementite.

Steels Containing Over 0.9 Per Cent of Carbon

So far we have been considering steel containing up to 0.9 per cent of carbon. Now let us glance at the steels containing above 0.9 per cent and up to 1.5 per cent—the upper limit of carbon which we took for our purpose. Above 950 deg. the steel exists as before in the form of solid solution of carbon in iron—martensite. As it cools, however, there is more carbon present than can be retained in solution, so that some of the carbon combines with the iron and forms cementite. This commences at approximately 950 deg. C. in steel containing 1.5 per cent of carbon, and as the temperature drops the cementite increases. The lower the total carbon, the lower the temperature at which the cementite begins to form. When 700 deg. C. is reached, the martensite cannot persist, and splits up into cementite and pearlite.

The first important point to notice is that, whatever the percentage of carbon, all steels above 700 deg. C. contain martensite, and it is this constituent which is characteristic of hard steels that have been quenched above (say) 760 deg. C. The second point is that, slowly cooled to below 700 deg. C., all steels contain cementite. Cementite is in itself an extremely hard substance, and withal brittle. In annealed steels below 0.9 per cent of carbon it exists (as already mentioned in conjunction with ferrite) as pearlite, and also surrounded by more or less free ferrite. Ferrite, however, is tough and soft, so that the lower the percentage of carbon the tougher and less brittle is the steel.

Even at 0.9 per cent of carbon, where the whole mass consists of pearlite, the ferrite layers in this give it a certain amount of toughness.

As 1 per cent of carbon is exceeded, free cementite becomes greater in proporition, so that the steels become naturally harder, but more brittle from the progressively smaller amounts of pearlite, and therefore of ferrite, which they contain. With these facts in mind, we are able to appreciate the changes that occur in annealing, hardening, tempering and case-hardening, and at the same time understand why tools for different uses require higher or lower percentages of carbon in them.

Annealing Steel

A steel that has been overheated and allowed to cool slowly, without being worked, is composed of large crystals; its structure is coarse, and it is very fragile.

This steel can be restored to a useful condition by heating to a good heat and forging down to dull redness, but even then it is not in an ideal state. This is particularly the case in forging articles of irregular shape which are subject to the defects of irregular extension and cooling and of cold working, while some parts may be of coarse structure owing to insufficient forging.

In addition to this, during the machining of already annealed steel, stresses are often set up which would probably cause cracking or breaking in subsequent operations.

Annealing is resorted to as a cure for all these defects, and the procedure to be adopted is as follows: The steel is heated up until the ferrite and pearlite or the cementite and pearlite, as the case may be, start to diffuse into one another, with the formation of martensite. This is the opposite effect from that mentioned when describing the cooling-down of steel.

Brearley gives the following temperatures for steels containing different amounts of carbon as those at which the change will take place:

Percentage Carbon in Steel	Lowest Temperature to Which Steel Must Be Heated
0.2	870 deg. C.
0.4	810 deg. C.
0.6	780 deg. C.
0.9	750 deg. C.
1.1	830 deg. C.
1.3	890 deg. C.

He adds that 20 deg. to 30 deg. above these temperatures causes no ill-effect, but the exposure must be a short one. When the heating has been finished, the metal is cooled down uniformly in the furnace until it is under visible redness, after which, as rapid cooling has then no effect on it, it may be cooled down to normal temperature as rapidly as convenient.

The usual object of annealing, apart from curing the defects mentioned above, is to render the steel as soft as possible for machining purposes, and it may entail softening steel which has already been hardened by quenching. In such cases, the steel is most quickly softened by reheating to within a few degrees of the hardening temperature, and then cooling in air. If this particular temperature is exceeded, however, the steel would, on cooling in air, be harder. This is illustrated by the following table (after Brearley), showing the Brinell hardness number, on reheating to various temperatures, of a quenched steel containing 1 per cent of carbon:

Reheated to	Hardness—Air-Cooled	Hardness—Quenched in Water
500 deg. C.	320	320
600 deg. C.	240	240
720 deg. C.	187	187
725 deg. C.	170	187
750 deg. C.	196	555
850 deg. C.	241	555
950 deg. C.	269	555

On the other hand, for thorough softening, the steel is heated to a temperature a little above the hardening

point, and is allowed to cool slowly in the furnace. Some authorities consider that the former or quick method, while not giving so soft a steel as the other, is yet preferable in some respects, as it gives a product that machines more sweetly. It will be readily understood how peculiarly gas-heated annealing furnaces lend themselves to the carrying out of operations of the kind I have been describing, affording as they do in unequalled degree the ease and exactitude of regulation which are so essential.

Hardening

The above table also gives us some idea of what is meant by hardening, and more need not be said about it than that water is not the only quenching medium —indeed, in many instances, oil, or preferably salt, baths are used for the purpose, as being less severe in their action than water. As a matter of fact, the hardening effect depends upon the rapidity with which the steel is cooled through the critical temperature, and it is in all cases completed by the time the whole body of the metal has arrived at 680 deg.

Salt Baths for Quenching

Baths consisting of fused salts, metals or alloys are used for hardening, provided their temperature is low enough. This proviso has, in the past, practically excluded the use of simple salts or metals for the purpose of quenching, as there are very few simple salts, and no cheap ones, with a sufficiently low fusing point. Fusible metallic alloys, which melt at a temperature below the boiling point of water, have been tried and found unsuitable. We have, however, recently developed the use of a substance called "Quenchene," which at ordinary temperatures is a white solid, but which is liquid at a temperature of 140 deg. C. It might be supposed that a liquid at such a temperature, well above the boiling point of water, would not harden carbon steel successfully. But the fact is that "Quenchene" has a very powerful quenching action, mainly because, its boiling point being above 800 deg. C., it does not form steam or vapor when the steel is plunged into it, and it remains in close contact with the steel, and extracts the heat from it very rapidly, which it could not do if the article were protected by a jacket of steam or vapor. Tools are rendered glass-hard by the use of "Quenchene," while the risk of cracking or warping is reduced to a minimum, as the temperature is sufficiently high to give rise to a distinct tempering action. "Quenchene" baths of various sizes heated by gas are in regular use in many engineering works.

Salt Baths for Tempering

After hardening, all tools are usually tempered—that is, heated to a definite temperature. There are many ways of doing this, but the best is to immerse them in a liquid bath of some sort. The object of this is to give the tool or metal sufficient toughness to withstand the shocks to which it is put during the work it has to do—the temperature at which the operation is carried out varies from 150 deg. C. to about 300 deg. C. or over. It was usual to heat the tool in air until it showed a certain surface color due to oxidization, but modern practice finds it more satisfactory to heat to a definite temperature in a liquid bath.

It is practically certain that the attainment of the exact "temper" is a function of temperature, while it has also been proved that the different surface colors can be obtained at various temperatures according to the length of time the metal is exposed.

The liquid bath (salts, oil or metal) has the further advantage that the whole of the article can be heated up to the same uniform temperature, while tools like files or drills, which require local tempering or softening in the tang or shank, are commonly dealt with by dipping these parts only in lead baths. In many cases our mixture of salts, known as "Feusalt," is used for tempering articles which require a higher temperature than can safely be applied to oil. Tempering processes often demand considerable accuracy, and a "Feusalt" bath, heated by gas, is an ideal arrangement for such work.

Case-Hardening

We now have briefly to consider case-hardening. This is a process whereby mild steel is caused to have a very hard surface to withstand wear, while the core of the article remains tough and soft. The metal to be treated, such as a camshaft or a gudgeon pin, is packed in a box with carbonaceous material like charcoal or yellow prussiate of potash, carbonized leather or the like. The temperature is then raised gradually to about 900 deg. C.

The length of time during which the metal is subject to the action of the carbon determines the depth to which the latter is able to penetrate. The temperature determines the rate at which penetration proceeds—usually this is somewhere about one-hundredth of an inch per hour.

During the casing process great care has to be taken to get the furnace evenly heated, because otherwise—as will be recognized—the "case" will not be of equal thickness all over the objects treated.

After this treatment the internal core is often in an undesirable state, due to the prolonged heating. This may be remedied in more than one way.

For instance, many articles are quenched in oil direct from the hardening boxes. This leaves the core in good condition, and prevents the formation of crystals during the cooling, but it is bad for the "case." The articles are accordingly reheated to about 760 deg. C. and again quenched—this time either in water or oil. The second heating does not injure the core, which has already been satisfactorily dealt with, but it greatly improves the "case," rendering it very hard and close-grained.

Another treatment consists in allowing the articles to cool in the box. They are then withdrawn from the box, reheated to about 820 deg. C., to deal with the core, and quenched in water. Subsequently, they are reheated a second time to 765 deg. C., and again quenched in water to get the "case" into the desired condition.

The reheating of carbonized work is best done in baths containing "Pyromelt." The "Pyromelt" leaves the surface of the articles (after quenching) glass-hard, and work so treated is in the best condition, because the temperature can be regulated to a nicety; also no part of the article can fail to be heated up to the

right temperature, and no part can possibly be overheated. Large numbers of gas-heated salt baths are in regular use for the reheating of carburized work.

Rustless Fuse Caps

Heat treatments are carried out in oven furnaces for a variety of purposes not included in the above. For instance, perhaps the latest we have designed is in connection with cast-iron fuse caps.

When made of this material, it is necessary to put the fuses through some process to prevent them from subsequently rusting. Of our two appliances for this purpose, the non-automatic form for this consists of an oven furnace in which the fuses, mounted on trays each containing fifty, are heated and then quenched in cottonseed oil. This gives the fuse a rustproof black surface.

The temperature must be within the limits of 650 deg. and 700 deg. C. Below 650 deg. the fuses would not take the surface, while above 700 deg. "growth" of the cast-iron commences and prevents the fuses passing the subsequent strict gauging test. In our automatic apparatus the fuses are placed one by one on holders which are passed through an oven furnace by an endless chain. At the outlet end they are automatically quenched in the oil, and drop onto a conveyor, which brings them out from the oil again. I only mention this particular process because it is practically a new one. The ordinary processes of heat-treating war material like cartridge cases, cartridge clips, bayonets, digging tools and the many other articles in general, have been frequently described. They all fall under one or other of the processes I have described under annealing, hardening, etc.

Manipulating the Gas Furnace

Before leaving oven furnaces, I should like to give a few points concerning their care and manipulation. Generally speaking, they are not called upon to stand such high temperatures as crucible furnaces, and it may be expected that the walls and arch will last an indefinite time.

The place where wear shows itself soonest is, of course, the bottom, where heavy weights are often placed. When the bottom is of slabs or tiles and heated from underneath, it will be seen that breakage can easily occur, and this consideration has lead to many furnaces being built with solid bottoms containing flues, such as the "Lopress" furnace already referred to.

Another thing to watch for is the dropping of scale or slag on the brickwork. This is always occurring, and it is as well to get rid of these materials at regular intervals.

Usually an oven furnace is built with the working space bounded by upright tiles or bricks. These prevent much scale getting into the combustion space below the slab. If these tiles are absent, the bottom slabs should be periodically removed, or an accumulation of such material may block the combustion space or the burners, and thus interfere with the working of the oven.

In the manipulation it is a good plan to work with as little primary and secondary air as the operation will permit. An intelligent use of the primary and secondary air sleeves and of the flue dampers will enable the user to save much gas. I have seen in an oven fitted with a pyrometer, where the temperature was running constant, a difference of 100 deg. C. either way, caused by slight manipulation of the air and flue dampers alone. One cannot give exact directions, but the correct manipulation will be found after experience, and depends on the temperature desired, the work to be done, the pressure of the gas, and so forth. In general, it may be said that sufficient advantage is not taken of the regulators provided. In all furnaces, but particularly for exact work like case-hardening, etc., it is a great advantage to fit a gas governor.

Heat Insulation

Another point in connection with the saving of gas may be mentioned. Some years ago we carried out a series of experiments on the heat insulation of furnaces, and as a result we were able to reduce very materially the heat lost by radiation and convection. But every user can increase the insulation for himself by spreading the outside of the furnace with any of the usual insulators. In this way he not only saves gas, but promotes the comfort of the workmen.

High-Speed Tool Steel

Before leaving the consideration of oven furnaces, it is necessary to mention those employed in the hardening of high-speed steel.

The whole subject of these special steels is of great interest, and is by no means in the comparatively explored and settled state of the carbon steels.

The properties expected from high-speed steel are those of hardness and resistance to the softening effect of heat. A turning tool, for instance, will cut mild steel at such a rate that its point is raised to a temperature of from 500 deg. to 600 deg. C. without softening.

The ability to perform work of this sort depends first on the composition of the tool and then on the heat treatment to which it has been subjected. When heated to 900 deg. to 950 deg. C. and quenched in oil, high-speed steel is quite hard, but it is not possessed of "red-hardness"—viz., the characteristic property of high-speed steel, of cutting mild steel at high speeds for a long time. This can only be ensured by the correct heat treatment.

Hardening High-Speed Tools

In the first place, the tool is presumed to be in the annealed state. It is then hardened from a high temperature, say, between 1,200 deg. and 1,300 deg. C. At this temperature, which varies slightly for each particular brand of steel, the formation of a double carbide of chromium and tungsten dissolved in the iron is supposed by some authorities to take place. It is not good practice to heat the steel directly from cold to this high temperature, on account of the tendency to crack.

In the furnace we specially designed for the purpose of hardening high-speed steel we provide two chambers.

One is heated directly by a powerful burner to a temperature rather above that at which the solution of the mixed carbides occur; the other, or preheating chamber, heated by the waste products from the first, attains a temperature of 800 deg. to 900 deg.

The tool is first placed in the preheater and raised to redness. It is then transferred to the hot chamber and rapidly heated. When the change takes place in the constitution of the steel, it absorbs heat and appears to be slightly darker in color for a short time.

As the change is complete, the tool visibly rises in temperature again—starting with the thinner parts. When uniformly hot, it is removed from the furnace and often cooled in an air blast or quenched in oil; but we prefer to quench in "Feusalt," at a temperature of about 230 deg. C.

I have so far dealt with the furnaces in general use, and the work they are put to. When one considers special furnaces that have been made, one is astounded at the numerous possibilities for employing gas. It is, however, impossible for me to deal with this side of gas heating at present; it would require a paper to itself. But I cannot miss the present opportunity of saying something on the subject of coal gas itself, as suggested by the experience we have gained in gas-furnace matters.

Importance of Standard Gas

When I last addressed this association, I laid emphasis on the view—which, indeed, we have long held and frequently expressed—as to the need for uniformity in the quality of gas supplied by the gas undertakings, and I described the difficulties of the gas-heating engineer, owing to the wide diversity shown in different parts of the country in such matters as pressure, calorific value, compositon due to the various qualities of coals, thermal treatments, percentage of water gas, etc. This need of uniformity is as great to-day as it was then, and in some respects it is more acute. The ground, however, has shifted somewhat.

High Calorific Value

Owing to the present circumstances, calorific value has, on the whole, tended to become more uniform. Gas engineers have had to be content with what they could get in the way of supplies of material, and there has been a general tendency for the higher calorific values to drop.

But while any movement towards uniformity in this direction is to be welcomed, it is necessary that it should not take place at the expense of uniformity in other directions. At the risk of repeating arguments with which you may be familiar, I must say that we, as gas-heating engineers, cannot look with equanimity on the reduction of calorific value if it is brought about by dilution with inert gases, nor do we welcome continually varying percentages of water gas or high specific gravities.

It is highly important in many gas-furnace operations that a high flame-temperature should be attained. As the percentage of incombustibles rises, this property is impaired.

Again, water gas requires, volume for volume, less air than the coal gas it replaces. A sudden jump from, say, 10 to 35 per cent of water gas—a not unknown happening—has a very considerable effect on a flame that has been set for the former percentage.

Generally speaking, we do not mind low calorific value—we have melted much metal by blue water gas alone; but we do ask you, as gas engineers, to assist us in the matter of flame-temperature, unfluctuating pressure and unvarying percentages of constituents likely to upset flame quality, and as far as possible to standardize the chief product of the gas works, so that, in whatever part of the country it may be, a reasonably constant quality of gas can be counted on. This is not merely a selfish request on our part. The essence of cheapness is standardization and the consequent output it allows, and uniformity in gas quality promotes standardization in apparatus, and so favors increase of output and cheapness.

The Future Market

Important as the question of standardization of gas is from our point of view, in closing I must direct your attention to a more serious side from your viewpoint.

You, as gas engineers, are trying to create and maintain a large output of coal gas for industrial purposes. The war, with its unparalleled call for explosives and for munitions, has enabled your output to increase by leaps and bounds.

What will happen to this output when the war is over?

I would urge that you supply a standardized product at a price that can compete favorably with rivals like solid fuel, oil, water gas and producer gas; otherwise the present rate of increasing gas output—on the furnace side at any rate (which I would point out is mainly due to the war)—cannot be expected to go on increasing after the war, but will receive a check.

I speak with knowledge when I say that the demand for these alternative fuels is an insistent and an increasing one. I hope I have said enough to indicate the great opportunity which, in my opinion, lies in front of the gas undertakings, and to show that the future of industrial coal-gas furnaces depends to a large extent on their policy in the next few years. If I have in any degree made these points clear, I shall have so far fulfilled the purpose of this lecture.

Town Gas Makes Saving Over Acetylene in Shops Doing Continuous Cutting

The Oakland industrial appliance department of the Pacific Gas & Electric Company has made some demonstrations in cutting iron with fuel gas and oxygen. A special torch is used whereby a hot flame cuts its way through the iron. A plate of iron 30 in. wide and an inch thick was cut in two in two minutes and fifty-five seconds, using 3.25 cu. ft. of fuel gas and 6 cu. ft. of oxygen. Acetylene was used, taking 3 lb. and 6.5 cu. ft. of oxygen to do the same work. Fuel gas makes a saving of about 50 cents per day in a large shop doing continuous cutting.

Fort Smith Viaduct Withstands the Elements and Then Some

"Protective paint costs less than rust catastrophe" is a saying of the Joseph Dixon Crucible Company, Jersey City, N. J. In its house organ, *Graphite*, for November, 1917, this concern illustrates the viaduct of the Fort Smith Light & Traction Company, at Van Buren, Ark., painted in 1914 with Dixon's Silica-Graphite Paint, with the paint still in good condition, despite the fact that the structure is carried over railroad tracks and is subject to continuous and heavy attack of smoke, heat, dust conditions, abrasion, etc.

Tests Reveal That Increase in Gas Leakage of Pipes Underground Is Approximately 80 Per Cent as Great as Increase of Pressure Put on Them

Experiments So Simple That They Cannot Be Considered Conclusive Evidence on the Subject, But They Open Up an Interesting Field for Investigation Under Various Conditions

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In order to determine to what extent an increase in pressure on a gas-distributing system would increase the amount of leakage the following experiment was performed: A piece of 2-in. pipe about 10 ft. long, containing a number of small holes caused by underground corrosion, was connected to a meter capable of working up to 20 lb. pressure. The meter was, in turn, connected to a high-pressure gas pipe. Careful observations were made of the gas pressure within the 2-in. pipe and of the rate at which gas was flowing into the pipe and thence out through the holes into the air. The record of the first test made with the pipe laying in an open trench is given below. All volumes are corrected to a pressure of 4 oz. above atmosphere. Natural gas of 0.68 sp. gr. was used.

Pressure		Cu. Ft. Flowing
Inches Water	Lb. Per Sq. In.	Out Per Hour
5.2	..	310
8.8	..	395
13.8	0.5	508
27.2	1.0	757
40.0	1.4	846
54.4	2.0	1,007
69.0	2.5	1,154
81.6	3.0	1,295
100.0	3.6	1,375

These results, obtained experimentally, agree almost exactly with those which would be expected theoretically, viz.: that the flow of gas through holes in a pipe would increase as the square root of the increase in pressure.

In order to make the experimental conditions agree more nearly with those found in actual practice, the pipe, already located in an open trench about 2 ft. deep, was covered with earth thoroughly tamped down as it was shoveled in. Observations were then made as follows:

Pressure		Cu. Ft. Flowing
Inches Water	Lb. Per Sq. In.	Out Per Hour
6.0	..	48
15.0	0.5	85
28.6	1.0	135
40.8	1.5	174
54.4	2.0	224
66.6	2.4	260
99.3	3.6	425
138.0	5.0	794
277.0	10.0	1,366
415.0	15.0	1,725

It is apparent from the above two tests that while the actual escape of gas is very much less where the pipe is firmly covered with earth than where it is open to the air, the ratio of increase of leakage with an increase in pressure is much greater. In the case of the covered pipe the actual loss of gas increases much more rapidly than in proportion to the square root of the pressure. In the interval from 6 to 28 in. water pressure the increase is approximately 60 per cent as great as the increase in pressure, while from 1.5 to 15 lb. per square inch the increase in gas escaping is almost in direct proportion to the increase in pressure. We can account for this condition only on the theory that as the pressure increases particles of earth which closed certain small orifices at the lower pressures are blown aside, thus opening new passages for the escape of gas.

Larger Test

Further information on the effect of increasing pressures through a higher range than used above is given by a test made on 15,000 ft. of 4-in. transmission line. This line had been underground, but out of use, for a number of years, and was known to be in bad condition. It was cut off at each end from other lines with tight gate valves, and then pumped up with 0.72 sp. gr. natural gas to a pressure of 69 lb. The gas was shut off and observations of pressure made at ten-minute intervals. As there was no consumption whatever on the line, the loss in pressure was due solely to gas escaping. The rate of escape at different pressures was calculated from the known volume of the line and the observed pressures, as follows:

Average Gauge Pressure for Ten-Minute Period, Lb.	Rate of Loss Cu. Ft. Per Hour
30	2,700
35	2,700
40	3,600
47	4,200
56	4,800
65	4,800

In this case also the rate of increase in loss is much greater than as the square root of the increase in pressure. Apparent discrepancies in the individual observations recorded are, of course, due to experimental error in taking the time or pressure, or both. The general trend is, however, unmistakable, and indicates that the increase in leakage is approximately 80 per cent as great as the increase in pressure. This result, obtained on an actual underground pipe line, agrees, then, fairly well with the experimental results already obtained.

While the above simple experiments cannot be considered conclusive evidence on this subject, they

open up an interesting field for investigation under various conditions. The importance of the whole subject can hardly be overestimated when the question of converting an existing low-pressure system to medium or high pressure is being considered. It is, therefore, hoped that the results of further work along these lines will be reported by other investigators.

How the Gas Companies Are Helping the Nation

THE PACIFIC GAS & ELECTRIC COMPANY, in its most recent issue of the *Pacific Service Magazine*, published an Honor Roll of its employees from the different branches now in the service of the United States. The following names are among those listed:

Fred Akerheilm
Arthur M. Bohnert
Joseph Butler, Jr.
Jesse W. Buzzell
George H. Canfield
Leon F. de Fremery
Edward A. Dunne
Harold C. Dunton
Theodor C. Fronmuller
E. L. Gray
Fred B. Hauck
Crawford C. Hill
Hector Keesling
Cecil L. Hornberger
William N. Lindblad
Harry Abernathy
Harold M. Anderson
George Barrett
Herman V. Bennetts
Travers F. Botts
Lee Braemer
Joseph Bruno
Arthur E. Chandler
J. Currier
William Erickson
Allan E. Ferguson
Robert E. Forbes
Stewart Frederickson
Earl D. Gay
Hans J. Hansen
E. J. Hoffman
Malcolm L. Hunt
Edward Jacobs
Harry R. Jenkins
Ivor Jones
Samuel Klinefelter
Charles Knopla
Chester W. Larue
William E. Leahy
Michael Longo
Washington B. Mel
M. B. Mensing
Robert A. Monroe
Elmo N. Murphy
Norris W. Osborn
Frank S. Rubenstein
John C. Schuster
Cyrus N. Smith
W. D. Starrett
Richard H. Stevenson
J. Terhell
G. M. Thomas
John Watson
Leroy C. Williams
Ernest M. Wright
George L. Luce
Francis I. Maslin
Dante Massoni
Leon A. Mills
Lloyd M. Morrill
James N. Mosher
Erwin S. Perkins
Orton L. Pershing
George J. Prefontain
Chalmers G. Price
R. A. Pullen
John M. Rowe
J. E. Sibbett, Jr.
Stuart N. Smith
John J. Streeter
Clarke C. Thompson
Ralph O. Wagner
Milton Walker
Anson B. Weeks, Jr.
A. B. Youngstrom
Crist C. Andrews
Oliver R. Johnson
Francis J. Meagher
Leon R. Potts
Remi C. Knight
Earl R. Randall
Charles T. Mess
Peter V. Berkey, Jr.
Leo M. Kass
Leslie H. Smythe
Emmet N. Britton
Charles A. Meservey
John A. Devlin, Jr.
Ray Stearns
Charles E. Everson
Frank J. Carey
James Doherty
Albert Johnson
Michael O'Grady
William F. Pape
Frank P. Reardon
Raymond W. Netherton
Charles E. Altpeter
John A. Compton
Miles A. Stone
Marcel P. Lohse
William Z. Butterworth
O. J. Stearns
Wm. L. Close
Robert B. Gowans
Monroe L. Taylor
Maurice Hallahan
Michael J. Ryan
Joseph Schwartz
Joseph M. Simon

LIEUTENANT MILTON EVANS, formerly an employee of the Scranton Gas & Water Company, of Scranton, Pa., was recently tendered a dinner at Lohmann's Restaurant by the employees of the company. There were thirty-five employees present. During the evening Lieutenant Evans was presented with a solid gold wrist watch.

R. H. CARPENTER, for several years past manager of the Western United Gas & Electric Company's office at Harvard, Ill., recently took the examination preparatory to enlisting in the engineering department of the army and passed successfully. He has been assigned to duty in the gas fitting department, and is now at Jefferson Barracks, Missouri.

ROBERT NOWLAND, formerly with the San Diego Consolidated Gas & Electric Company at San Diego, Cal., is now a member of the U. S. Aviation Corps, stationed in the training camp at Foggia, Italy.

J. E. STODDARD, formerly with the H. M. Byllesby Company, has enlisted in the national service and is now in the Ordnance Department.

T. J. MCGRATH has enlisted in the navy in the capacity of chief yeoman. He was formerly with the H. M. Byllesby Company.

A. S. BUTTERWORTH, formerly of the Citizens Gas & Electric Company, Waterloo, Iowa, is now in the U. S. Army with the Gas and Flame Regiment.

L. WOODWARD, secretary and treasurer of the Santa Anna Gas Company, of Santa Anna, Tex., has signed up for service in the Gas and Flame division of the army.

LIEUTENANT HARRY M. ATKINSON, JR., formerly of the Atlanta Gas Light Company, Atlanta, Ga., recently spent a four-day furlough in Atlanta just before reporting to Fortress Monroe for duty. Lieutenant Atkinson is the son of H. M. Atkinson, chairman of the board of directors of the Atlanta company. Lieutenant Atkinson has received his commission in the Coast Artillery of the Regular Army and will begin active

(*Continued on page* 598)

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The Hundred and Eighth Volume

Reference was made editorially in the first issue of the current volume to the great obligation this Journal was under to individuals in the gas industry for co-operation in helping it to render an accurate and practically-useful service. The hope was expressed that the number of those actively interested in the editorial welfare of the Journal would be vastly increased. During the six months that have ensued this hope has been realized beyond our greatest expectations. Particularly is this so in the case of contributors of original articles. The number of these that we have been privileged to pass upon, and the range and variety of subjects dealt with, have been extremely gratifying.

This indicates a most healthy condition in the gas industry. No journal which has had the number of articles offered to it that the American Gas Engineering Journal has had during these past six months can complain of lack of co-operation on the part of the industry. With the gas man assisting in such manner there can be no excuse for a journal's not rendering the kind of service to the gas man that his needs require.

Unsolicited commendations that have come into this office are convincing to us that, in a number of cases at least, we have attained the highest ideal we have set for ourselves—that of rendering a service that is useful to our readers in that it brings to them information that they really need and, though they had not expressed in words, were consciously or unconsciously trying to get hold of.

The possible value of an adequate gas journalistic service to the gas man at any time, but particularly in these war times, is beyond estimate. A very considerable part of this value may be easily attained if the field will co-operate with us in the same manner with the Hundred and Eighth Volume as it has with the volume now ended.

Scampering Away from Basic Facts

In the gas industry we are suffering from "notions;" not only our own, but those of others. On the part of the others these "notions" are understandable though none the less harmful. They are founded on ignorance. On the gas man's part they are not even understandable. He knows better.

In at least one section of the country we have heard of an overenthusiastic, but poorly informed, coal conservationist advising the public to restrict its use of electricity, gas, etc., with the plain inference that they are luxury fuels.

As a matter of fact, aside from the by-products, it would be an exceedingly desirable condition for the national interests if all domestic cooking was done

by this luxury fuel gas. The effect would be a considerable saving in the amount of coal used, as it is established that the family using coal through the agency of gas is requiring the consumption of a considerably less quantity of coal to provide for its needs.

If every fireman in charge of the boilers of large heating installations was perfectly conversant with the most efficient methods of using coal for steam raising, there might be some question as to the actual fuel conservation—aside, again, from the by-products—of complete gas-fired heating installations under severe climatic conditions. Under existing circumstances, however, it seems conservative to state that if every apartment house of any size in all our cities were completely gas-heated there would be another considerable saving in the tonnage of fuel used. Much can be accomplished by simply transferring the responsibility of burning the country's coal from unskilled janitors to highly specialized fuel experts.

Industrial fires that are kept burning when no work is being done with raw fuel in use would be shut off thousands and thousands of hours if gas were the fuel employed. On this basis alone vast quantities of coal would be conserved in the industries if gas were at present generally employed in every task to which it is efficiently adaptable.

Speaking in terms of tons of coal, not in dollars—on the basis of primary fuel costs alone—economies so vast as to stagger the imagination could be effected could we turn to so ideal a state. When one leans back and pictures the quantities of explosives that could be produced if gas in quantities as to serve such purposes was being consumed and the results their liberal, one might add extravagant, employment would produce, the prospects presented to one who feels for his fellow man, for the hundreds of thousands of his countrymen who have their faces turned toward the trenches in Europe, seem alluring in the extreme.

Yet despite these basic facts, despite the fact that the market for gas already taxes and overtaxes plants constructed within the recent past, there are gas men running around in circles, pessimistic in the extreme and doubting the future of the industry.

There isn't a great deal of new construction under way. There should be, though. Gas companies are deterred by high prices and high costs. Financing is a complex and difficult problem.

But this JOURNAL ventures a prophecy. If the war drags out, if we face another winter with no more prospect of a termination of hostilities within a measurable period of time than is now presented, there will ensue an era of frenzied gas works construction that will resemble in many respects the present era of shipyards construction.

The gas industry is essentially and pre-eminently an essential industry; essential not only because of its by-products, but of its primary product.

One hears of no complaints as to lack of market. For lighting, heating and industrial tasks gas can be sold to-day with less effort than has ever been required in the past. The difficulty lies in getting the gas and the appliances to serve the market that in many cases is literally begging to be served.

Questions of financing, of labor and of materials will not deter the movement once the governing powers of the nation realize how important and how useful a purpose a vastly increased manufacture, distribution and use of gas will serve. The nation is getting into its gait on the conduct of the war. Difficulties such as those enumerated will be brushed away as nothing when the necessity of doing so is fully sensed.

Keeping the Experienced Employee in the Organization

A manufacturer we will call Jones had made a fortune through his ability to handle men. Then he turned the job over to a subordinate who carried the title of efficiency expert.

One of this younger man's strongest beliefs was in standardization of salary increases. He was convinced that a regular process of raising each employee's salary a fixed percentage each year would keep them contented.

No unmeritorious employee would profit with the rest in this standardization. He would have been "fired" before the day set for the general increase had arrived.

No provision was made, however, for unusual increases to unusually-deserving employees. It was this omission that lost to the company the services of an employee we will call Smith.

It was said of him that when he closed his desk for the last time there were tears in his eyes. He had held a job with the company for fifteen years; during part of them he had supported a widowed mother on it, later a wife and a family of growing children. Through the return it gave him he had been able to keep them in comfort and provide for them the brighter things of life. It was but natural that he should love the work that made these things possible.

But Smith had developed with unusual rapidity. Outsiders noted his development even if his own firm did not. As a consequence he received an offer, at a considerably higher salary, to go elsewhere.

The efficiency man valued Smith as an employee, but he preferred to lose him rather than forsake his standardization scheme. Following his own inclina-

tions Smith would have rather remained with his old employer, preferring to sacrifice the extra compensation to going elsewhere and severing all his old ties. But it was his duty to his dependents to gain from his labors their full value.

The efficiency man did not succeed in satisfactorily filling his position. After several disappointments he was willing to concede that he had made a mistake. He proposed to the employer, Jones, that they offer Smith somewhat more than he was getting in his new situation.

"It will not bring him!" declared Jones. "When he was still with us we could have kept him at 60 per cent of what he might be worth elsewhere. Now we couldn't get him back for a hundred per cent more."

"Why?" questioned the expert, who made it a practice to stick to statistics and left the exercise of imagination to the practical type.

"He's lost confidence in us. He was with us so long and we knew him so well, we took his accomplishments too much as a matter of course. In his present situation he's new. Every especially good job he turns over is a fresh revelation to them.

"Smith *is* smart. He's prolific in practical ideas.

"Doubtless he's getting patted on the back several times each week. Quite a contrast to what he got here!

"We knew he was doing good work, but allowed ourselves to get into the habit of expecting that kind of work from him as a matter of routine. So we never told him our thoughts.

"Unless I'm all wrong, he's worked up an incurable grouch against us by now. Moving about in an atmosphere of general commendation, he looks back on us as inappreciative grabbers of the most extreme type."

How the Gas Companies Are Helping the Nation

(*Continued from page* 595)

service at once. He was graduated with distinction from Harvard, where he was a member of the football team, and received his first military training at Plattsburg. He was with the Thirtieth Infantry at Charlotte, N. C., until his transfer to the Coast Artillery.

THE UNITED GAS IMPROVEMENT COMPANY, of Philadelphia, in addition to those names already mentioned in previous issues from the different departments, has 100 employees in active service from the manufacturing department. The following are some of them:

Name	Command
Wm. Adair	Camp Meade
Anton Arntz	Battery F, 2nd Pa. Artillery
Herbert M. Asquith	Battery F, 2nd Pa. Artillery
Geo. W. Barnes	Unknown
William Bathner	Quartermaster's Dept.
John H. Beltz	Camp Meade
Archibald Borbeck	Camp Meade
J. A. Boyce	Camp Meade
Earl H. Blake	U. S. Aviation Corps
Frank J. Brady	Camp Meade
John S. Buckley	U. S. Ambulance Corps
Harry Cahill	Battery F, 2nd Pa. Artillery
Oscar Callen	Camp Meade
Raymond Callen	Company D, 3rd Pa. Infantry
Michael Carter	Battery F, 2nd Pa. Artillery
George Caves	Engineers
Rafele Christino	Camp Meade
Michael A. Connelly	Battery F, 2nd Pa. Artillery
J. Cowan, Jr	Camp Meade
James Craig	Company H, 58th Regt., U. S. Infantry
Adolph Davis	U. S. Army
G. DeCeneo	Camp Meade
Stanley Demsky	Camp Meade
Jos. B. Diflendal	Base Hospital No. 10
John Dougherty (No. 2)	Camp Meade
John Dzurow	Camp Meade
Vincent Fahy	U. S. Infantry
John Friel	Company H, 58th Regt., U. S. Infantry
Geo. L. Galbraith	U. S. Marine Corps
Neil Gallagher	Camp Meade
Joseph Gassenmeyer	U. S. Marine Corps
Lee Gee	Camp Meade
Clifford Gibbs	Battery F, 2nd Pa. Artillery
Wm. Goodrich	Camp Meade
Jess Gindhart	Company E, 2nd Pa. Artillery (Reserve)
Wm. Gimmi	Stoneman's Hospital Ambulance Corps
Jos. J. Gordon	Battery F, 2nd Pa. Artillery
Thomas Hendricks	Battery F, 2nd Pa. Artillery
Geo. Henry	Machine Gun Co., 6th Pa. Infantry
W. J. Hinke	Battery F, 2nd Pa. Artillery
Charles H. Horn	Battery F, 2nd Pa. Artillery
Charles F. House	Company E, 1st Pa. Engineers
Martin Joyce	Camp Meade
Robert H. Kaufman	Battery F, 2nd Pa. Artillery
Richard Kelly	U. S. Army, Fort Slocum
Jesse R. Lamplugh	National Naval Volunteers
J. B. Lancaster	National Naval Volunteers
Joseph Lyons	Battery F, 2nd Pa. Artillery
John Madsen	6th Company, U. S. Coast Artillery
James Martin	Company F, 1st Pa. Infantry
Chas. G. Miller	Naval Reserve Force
Edward Miller	U. S. Cavalry
Leander Morrell, Jr	Coast Artillery
John J. Mullen	Company D, 3rd Pa. Infantry
Daniel Murphy	Naval Reserve Force
Eugene C. Murphy	Battery F, 2nd Pa. Artillery
Harry J. Murray	Company D, 3rd Pa. Infantry
Jas. McCoy	Camp Meade
Thos. McCusker	Naval Coast Defense Reserves
Robert J. McDonald	Company K, 6th Pa. Infantry
E. J. McGettigan	Battery F, 2nd Pa. Artillery
Wm. J. McGrath	U. S. Navy
Wm. McKinney	U. S. Navy
George McKnight, Jr	U. S. Navy
James J. McMullen	Company K, 6th Pa. Infantry

Merchandising Gas

December Meeting of Gas Sales Association of New England Brings to Light an Unusual Demand for Commercial Lighting Units

Paper Presented by W. H. West — 167 lb. of Coal if Turned to Gas Will Do Cooking It Takes a Minimum of 800 lb. of Raw Fuel to Accomplish

The regular meeting of the Gas Sales Association of New England was held Friday evening, Dec. 14, 1917, with nineteen men present.

The meeting was called to order at the City Club, Boston, by the governor, Mr. Gould, who spoke of the great amount of pessimistic talk which has been circulated throughout the gas industry as a whole since the war has been declared. He thought that we should look more on the bright side of things. We need more loyalty, more enthusiasm, more "punch." This looking at things pessimistically was an aid to the German propaganda, and if we cannot say anything helpful, don't say anything. Never before was there a time when so much energy and enthusiasm were needed by all the members of the gas industry.

Mr. Clark, of the Boston Consolidated Gas Company, spoke of the generally optimistic feeling which was shown at the joint meeting of the board of directors of the National Commercial Gas Association and the Gas Institute.

Paper on Gas Lighting

Mr. Gould then introduced Mr. West, of the General Gas Light Company, who read the following paper on gas lighting:

Having been informed of the assignment to me to present facts on gas lighting for this meeting, I began by asking myself what I could say that has not already been said on this very important subject. There have been several most excellent papers presented before various associations in the recent past, and I dare say many of you have read and considered them carefully, but what of the vast number of gas men who haven't read them?

I'll give you the answer to this. Visit the majority of towns in New England where these men live and do business, and you will find a most deplorable condition as regards gas lighting. I do not wish to convey the impression that the reading of certain papers on this subject is highly essential to the real activity along lighting lines, but I do maintain that the successful men are the ones who are constantly on their toes and alive to everything and do keep in touch with what the other fellow is doing.

Humanity the Same in Every Town

There are those, however, who would like to do as their neighbor does, but for some reason or other take the stand that the methods employed in one town will not fit their particular case. I am firmly convinced that this is all "bunk," and that if you will but make an effort to get out of the rut you are in, and go after the best part of your business, believing in it, and with determination, you will soon realize that humanity is the same in one town as it is in another.

I have in mind a particular town in New England, where the local manager had been a resident of the town for many years, and was satisfied that he knew, absolutely, that his business could not be increased, for, as he thought, it wasn't in the town.

He got away with this stuff for a certain length of time, until finally the owners of the property gave him a year in which to accomplish certain increases or hand in his resignation. It is needless to add that the success he met with was way beyond anything he had ever dreamed of.

I simply mention this to show you what can be accomplished if you are driven to it. It should not be necessary, however, to resort to such drastic measures as was the case of this last mentioned, for if you believe in the product you are selling, and you must believe in it to do justice to yourself or company, you will not allow yourself to get into the rut of inactivity.

To quote from a most excellent paper by Mr. Luther, of Chicago: "Have you ever stopped to consider what you are doing when you sit tight and allow your gas lighting to get away from you?

"You are admitting that you do not believe in your own product. You are admitting that you believe in the superiority of the other fellow's product, a product which was brought into commercial use after yours.

"You are admitting that you believe in conceding to the other fellow business that by all means should be listed on the credit side of your ledger. You are admitting that while not believing in gas as an illuminant, you are still willing to draw your salary under false pretenses; *i. e.*, you should believe in the various uses of the product you represent.

"Are you afraid of the other fellow or his equipment? Or maybe you have been afraid to come out in open competition to demonstrate which was the best."

Afraid of Competition

I am of the opinion this last paragraph is the keynote of the whole situation. Afraid of competition! If you will allow yourself a few moments' thought and follow the gas business from the time it assumed any prominent part in the commercial world, you cannot help but notice the tendency of the gas men to resort to the course of least resistance just the moment the other fellow became active.

When he found another in the lighting field, he turned his attention to another means of disposing of his product, and, step by step, where keen, aggressive competition has become a fact, he reverts to some other field, where, in his mind, he will be free from the other fellow.

Would you call him a slacker?

And yet in direct contrast to this is the case of many of the combination (gas and electrical) companies here in New England, where there is no apparent restriction on the part of the company to its gas department. Such companies are out to get all the business possible, regardless of

whether it's lighting, fuel or otherwise.

Why is it that where such a condition obtains you will almost invariably find a greater percentage of gas lighting in the town? And why is it that in a town where a combination company controls the situation and the gas department is allowed only to go after the fuel end of the business, the consumer will persist in lighting with gas to the extent of purchasing his lighting equipment from the manufacturer or out of town? It does not require much thought to arrive at the answer.

Selling Against Radically Cheap Electricity

To those of you who take the stand that the electric rate in your town is so low that it is impossible to keep or get new lighting business, I might refer you to a recent paper by Mr. Allen, of the Consumers Gas Company, at Toronto, Canada, wherein he stated that in the face of the electric current as low as 7/8 cent per kilowatt-hour, his company has shown an increase in daily output from 5,000,000 to 11,000,000 cu. ft., and the number of consumers from 55,000 to 108,000 (American Gas Engineering Journal for Nov. 10, page 417). This, he states, covers a period of eight years.

Do you imagine that these results were obtained by men who did not believe in gas lighting and were following the course of least resistance?

If ever you had an opportunity to go after and secure gas lighting without much effort, now is the time. With our Government calling for certain by-products from the manufacturers of gas for war purposes, it is only reasonable to assume that our needs as to manufacturing requisites, such as coal, oil, etc., will be provided for, and the action on the part of the United States Fuel Administrator in the instance of electric signs and electric display advertising in connection with the conservation of fuel, certainly opens up a field for outside gas lighting in many of your towns.

There are many of you who do not need encouragement of this nature, but I have in mind the ever-present pessimist, who runs away from competition, and it is to him that I take occasion to assure that he might well feel free to go after gas lighting without fear of the other fellow at this time.

It is very true that the labor situation has become a serious matter with many of the companies by reason of the draft, etc., and yet I find a great many of our wide-awake New England companies that do not complain of this condition, and apparently are able to keep their organization complete.

It is not my purpose in this brief paper to attempt to outline the various methods of securing or holding your gas lighting, for much has been written on this subject in the past, and my remarks would only seem to be a rehash of what has been taken up before; rather is it my desire to prod the fellow who is rapidly allowing the most profitable part of his business to get away from him, and in my efforts to do this I trust I have not created an offense.

Have you ever asked yourself, "What other business continually solicits new business without paying any attention to the old customers?" By this I refer to the apparent desire to reach certain new territory, and, of course, this desire is actuated by that feeling of freedom from competition.

In the meantime, what has happened in your old and original territory?

Have you been able to hold that lighting as you have the rest of the business? Has not your competitor taken advantage of your inattention to it, and in many instances has he not been successful in persuading your old customers to become users of his product?

And just about the time you are feeling highly elated over the apparent increase in your business, by reason of the new territory, you are confronted with the fact that your gas sales do not show the increase you were certain of, does it dawn upon you that you have suffered severe losses by the lack of attention to your old customers?

I am reminded of a certain case, a wide-awake city here in New England, where the gas company had been advised to abandon all new business efforts by the concern from whom they purchased gas coal, the reason for this being a fear of shortage of coal. As a result, the commercial department of this gas company was practically abandoned, with the exception of their lighting salesman. It can readily be seen that this was a wise move, for they were quick to see that any let up in their activity on lighting gave their competitor a chance to secure business which the gas company might have difficulty in recovering, whereas, in the matter of fuel appliances, there were no fears that the competitor would prevent their getting this business at some future time.

In the commercial lighting field many of the gas companies are finding it a comparatively easy task to secure a volume of business, the displacing of electric lighting requiring not a great effort. One of our New England companies reports having taken about 200 consumers away from the electric competitor in a few weeks' time. There are several excellent successful methods of securing and holding commercial gas lighting, but the real secret of these methods lies in the proper maintenance. Without this, I cannot see how any straight sale or rental plan will ever last very long. It is a fact that gas-lighting equipment, the maintenance of which, if left to the consumer, will, without question, cease to be used and put the consumer right in line for any easy drive by your competitor.

Because of the conditions imposed by the Fuel Conservation Committee on electric sign and outdoor lighting, there is a wonderful chance for the gas man to make his drive for this business which, when these war-time conditions cease, means that the gas lighting will continue, as you know that every outside installation brings another one, and even this is showing a line of least resistance.

Whether it is the lack of courage, fear of competition, or what not, it certainly seems to me that you have everything in your favor at this time. The manufacturers have practically placed themselves at your dis posal, and seem ready and willing to give you every assistance possible.

. . . . .

T. H. Piser, of the Welsbach Company, said that if there ever was a time when we should push gas lighting it was now. We have the appliances, we have the opportunity.

Mr. Woodhead, of Arlington, said that Arlington tried to get away from saying that lighting by gas was cheaper than electricity, because talking about price alone causes trouble. Rather than talk on the cost basis, we should push the quality side of our lighting. Arlington is pushing the gas outside lighting, which is not only a good proposition for the gas companies, but also the merchants. Mr. Woodhead said that for house light-

ing we now have excellent fixtures and lighting units, which we can push with credit to ourselves. During the last two years Arlington has gained a great deal of house-piping by pushing side outlet lighting where the outlets can be used for heaters and other appliances as well as the lights.

Mr. Gould spoke about the great amount of co-operation which has been shown lately by the manufacturers. Never before have they so placed themselves at the disposal of the gas companies.

Mr. Conroy, of the General Gas Light Company, expressed his opinion that the one thing the matter with gas lighting is that gas companies have not been pushed hard enough by competition. He quoted the report of the Pennsylvania Gas Association's Committee. He said that the public at large appreciated gas lighting far more than the gas companies appreciated the value of getting and holding the lighting business. Mr. Conroy said that in Portland, Ore., the electric rate was lower than in any of our New England cities, and they were doing a great lighting business. The New England complaint that the electric rate was so low that they could not compete was shown by this to be a fallacy. He told of one man who said it would be impossible to get more than twenty outside lights in his town, and the reply was why didn't he get the twenty.

Mr. Conroy said that what the gas companies needed to do was to go out after the business and stay out once they got it; that it was more important to hold the old business than it was to get new. One of the faults of the gas companies is that they push gas lighting hard enough in the winter, but leave the whole deal to the electric companies in the summer, no one following it up. He said that he favored rental, because it guaranteed maintenance and assured that the lights would be followed up.

In quoting figures regarding the gas arc, it was said that the gas would burn about 20,000 cu. ft. per year. One thousand of these would burn about 20,000,000 cu. ft. per year.

Is it not worth while?

Go after this business on an investment basis. Surely it is worth more to have 20,000,000 on an already existing appliance than it is to build a small plant whose entire send-out might not be over 20,000,000 per year.

Following out Mr. Gould's remark about going after things with a punch, and stopping the cry about hard times, etc., Mr. Conroy stated that the Government takes the dearest thing—life—from a young man when it sends him to the front to fight. Why can't the older men give a little of their time and effort *willingly* when that is all that is asked of them? They certainly should not growl about the small sacrifices they are asked to make.

Mr. Gould thanked Mr. Conroy for backing up his remarks, and said he himself thought we had too easy a time in the past. Now is our opportunity to display our good qualities during these trying days.

Good Results from No Great Efforts

J. B. Anderson, of Brockton, said that Brockton had started a campaign to put out semi-indirect lights. They are making a good profit on these lights, and are not spending a great deal in the advertising proposition. Up to date, they have sold somewhere around 362 of them. He said we are simply negligent in not getting out after our business; then, once getting it, keeping it; that we did not keep behind our men enough. His policy was to keep everyone busy during hard times, so that they did not have time to think about financial conditions. He hoped that some day the manufacturers would get out a respectable valve, so that the American public would have no opportunity for their latest objection to gas lights.

Mr. Clark, of the Boston Consolidated, spoke of the progress they are making in gas lighting.

In the year they have put over 3,900 commercial units on a rental basis. When the tenant moves out they do not remove the lamps, but go after the new tenant. In the last month they have put out about 1,000 new lamps on a rental basis. They were not giving away the rental either. In a recent advertisement they promised that Boston would give one C. E-Z. light to each consumer, and he said that Boston hoped to place about one-half a million of these lights in the next few months. Wherever a free light was installed, they expected to sell three more in addition. In Brookline they have installed anywhere from 100 down to five for each consumer where they have made such an installation. He spoke of following up house-piping installations, where electrical wiring was put in afterwards. He said that over sixty installations in the downtown district had to be rerun at the expense of the electrical people because they had destroyed the piping. He said we surely must keep after the lighting continuously if we expected to have any kind of a lighting business.

Mr. Pease said that previous remarks had been proven to him, that we could work disadvantages into advantages, if things are forced on us. Never before have we had such beautiful lighting fixtures. He spoke of the excellent installation of outside lighting in Roxbury, and thought the merchants had put it in not so much on a lighting basis as an advertising. When a merchant closes his store at night, his overhead goes on just the same. Good lighting needs a salesman on the job all night. Any merchant ought to be willing to pay $8 or $10 a month for someone to stand on the walks and call attention to his goods. The outside gas arc is such a salesman. He spoke of one place where a merchant pays anywhere from $5 to $65 per light for the piping alone for an outside gas light. Thousands of these have been installed on the same basis. He also spoke of a city where 75-cent gas was used in competition with 2-cent electricity and over 10,000 gas arcs had been put out on a quality basis, and he said we should install gas for quality, not for cost.

Mr. Smith suggested that we should get after the coal conservation commission of the State and show them that people should increase the use of gas rather than decrease it, as the commission is at present advocating.

The Government needs the by-product, and the only way to increase it is by increasing the sale of gas.

Coal Economy in Cooking by Gas

In reply, Mr. Gould said he had tried to show Mr. Storrow that the minimum coal used for cooking was 800 lb. per month, and that the same amount of cooking required only about 2,000 cu. ft. of gas, which called for only about 167 lb. of coal. In other words, in using gas the same consumer used only 167 lb. of coal, against 800 lb. directly through the coal range. Since this talk the coal conservation commission has gotten out a mild pamphlet asking the peo-

ple to use oil, wood or gas, rather than coal. Mr. Gould is going to follow up the commission on this work, and asked for figures to strengthen those he had to show the saving in the use of gas.

In England the Government got out an appeal to all patriotic people to use gas for light, heat and power to help in the manufacture of munitions. Why can't we get the same in this country? Our argument cannot be too strong and we need the figures from everyone to back up our cause.

Mr. Gould then introduced Lieutenant Wright, the executive officer of the Naval Training Station at Hingham, who spoke on some of the interesting experiences before war was declared, and of the need of combating the German propaganda. At the conclusion of his talk, Mr. Wright was elected a member of the association as our navy member.

Heater Drive Staged at a Time When Thermometer Outside Office Registered 110 Degrees Proves Successful

E. A. McCarthy, sales manager of the Savannah (Ga.) Gas Company, describes a successful heater drive staged at a time when weather conditions were such as would seem to nullify the salesmen's efforts in the last issue of *New Business*. His story, in part, follows:

Feeling that summer was the time to prepare for cold weather, and desiring to put an extra sales stimulus into the month which is usually the dullest of the year, our salesmen got together in July and made a cohesive drive on gas heating business.

They started July 15 to develop and follow up prospects for Clow Gasteam Radiators and other types of heating appliances. These efforts continued until Aug. 5. They were successful not only in a sales sense, but in that the shop was enabled to install at that time appliances which would otherwise come under the next winter's work.

The accompanying table is a summary of the net orders obtained from July 15 to Aug. 5.

	Clow Radiators	Total Sections	No. 33 Reznor Wall Hts.	Hot Spots Connected Solid
Residences	21	285	8	18
Offices	16	201	..	..
Stores and banks	9	68	..	..
Churches	22	280	26	..
Business colleges	5	38	..	..
Total	73	872	34	18

A selling feature worth while which aided in this work was our heating portfolio, an ordinary photograph book containing local testimonial letters, blue prints of local installations showing the number and size of heaters in use, and, most important of all, the actual gas consumption of specific installations for the years 1915 and 1916.

There is something personal about the book and the prospect's interest and attention are gripped by it, for it is one of the points of human nature that you want to know what your neighbor, friend or competitor is doing.

Following is one of the testimonal letters shown in the book:

SAVANNAH, GA., April 18, 1917.
SAVANNAH GAS COMPANY,
Savannah, Ga.
Attention, Mr. McCarthy.

GENTLEMEN:

Referring further to conversation with you over the telephone regarding the Clow Gasteam Radiators in my residence, let me repeat that I have been more than satisfied with the record made by these radiators since I installed them last year.

I have three large rooms all very open, which are heated by the Clow Gasteam Radiators, and during all the cold weather we had this past winter there never was a time that I could not heat the whole lower floor of the house comfortably, and the cost has not exceeded $8 per month. The cheapness of the heat, to say nothing of the satisfaction of having no ashes, coal or dust, makes me a strong advocate for the Clow Gasteam Radiators, and had my gas bill been even three times larger I would not be willing to exchange it for any other method of heating.

Yours very truly,
(Signed) GEO. V. DENNY.

P. S.—Three Reznor Fire Place Heaters furnished heat to the second floor.

During the period when this gas-heating drive was being made the thermometer registered 110 degrees in front of our office. Would you think it possible to interest people in heating when the weather was doing everything it could to drive their thoughts in the opposite direction? Well, it was possible. It was done. The results speak for themselves.

Companies Combining to Get Fuel

Representatives of gas-producing companies in southern and central Illinois came to Chicago in a body last week to lay before State Fuel Administrator Williams the seriousness of the coal shortage confronting them. The lack of transportation facilities, the committee said, has cut off a large part of the gas coal supply from the Kentucky mines. They said that if relief were not forthcoming soon they would have to cease operations. Mr. Williams promised to look into the situation immediately, and to do what he could to relieve the situation.

The shortage of coal and coke became so acute this week that several of the steel mills and other industrial plants in the Calumet district were compelled to shut down temporarily.

Beaver Dam Company Granted Rate Increase

The railroad rate commission has granted a petition of the Beaver Dam (Wis.) Fuel & Light Company for an increase on its rates for gas. While the increase is not large it is an increase of about 20 cents per 1,000 ft. in an adjustment of the deduction for prompt payment at the first of the month, and also establishes a minimum charge, which it had not heretofore had. The new rate is $1.60 per 1,000 ft. for the first 2,500 ft., but the discount of 20 cents per 1,000 ft. is reduced to 10 cents, and a minimum charge of 60 cents is allowed, with a net minimum of 50 cents. The new rate is effective Dec. 1, and will continue until next July 1, when it will then be either continued or revised, according to the ruling of the commission at that time.

News of the Gas Industry

Negotiations Being Made for Sale of Centralia, Ill., Property

Negotiations are under way for the sale of the property of the Centralia Gas & Electric Company, of Centralia, Ill., to the Southern Illinois Light & Power Company. In this connection the two companies have asked the Public Utilities Commission of Illinois for permission to sell and buy the property, respectively.

Apparently the companies are agreed on the terms of the sale for the prospective buyer has already asked the commission for the proper certificates authorizing it to operate in the towns now served by the Centralia company. On Dec. 20 Commissioner Shaw, of the utilities body, presided at a hearing on these two petitions, together with another by the Southern Illinois Light & Power Company, for authority to issue its preferred capital stock in the amount of $301,900.

Rate Decision for Three Washington Cities Rendered

Announcement was made recently by the State public service commission in Olympia, Wash., of the new tariff allowed the Everett Gas Company. In brief, the small consumer, the one who uses little gas in excess of the 50-cent minimum charge, will have to pay about 20 cents more from the first 100 to the first 1,000 ft. than the larger consumer, whose advance will be less. The present charge of $1.35 for the first 1,000 ft. is increased to $1.60.

The minimum charge of 50 cents has not been altered, although the proposed "ready-to-serve" charge was denied but otherwise taken care of.

The commission's letter to the Everett Gas Company reads:

"Gentlemen: In regard to your tariff No. 3 rates for gas in Everett, Snohomish and Monroe, and Snohomish County, outside the corporate limits of Everett, Snohomish and Monroe, this tariff has been modified as follows:

	Net.
First 100 cu. ft. or less	$0.50
200	.65
300	.70
400	.85
500	1.00
600	1.15
700	1.30
800	1.40
900	1.50
1,000	1.60
	Per M. Cu. Ft.
Next 4,000	$1.40
Next 5,000	1.15
Next 40,000	.85
Next 50,000	.70
All over 100,000 cu. ft.	.65

"Otherwise your tariff No. 3, as filed in compliance with the alternative proposition submitted at the hearing, will stand.

"This will be covered by a formal order.

"PUBLIC SERVICE COMMISSION,
"A. A. Lewis,
"Frank R. Spinning,
"Commissioners."

Selectmen of Amherst Favor Increase

The following letter has been made public to the people of Amherst, Mass., by the board of selectmen:

"Some time ago J. J. O'Connell, superintendent of the American Gas Company, took up in an informal way with the board of selectmen the question of an increase in the price of gas delivered to the company's consumers in the town of Amherst.

"The gas company claims that, owing to the increased cost of material and labor in connection with the manufacture of gas, the plant is being operated at a very considerable loss.

"The board of selectmen have had a number of conferences with the company's representative in connection with this matter, have made some investigations, and have finally reached the conclusion that the gas company is entitled to some increase in the price of gas.

"Although the increase which we recommend is somewhat lower than the gas company feels it should be, we believe that the price of $1.75, with a discount of 5 cents per thousand cubic feet for prompt payment, would be a fair proposition to both the consumer and the company.

"The above price is based on the present conditions, and necessarily would be subject to an increase or reduction as future conditions might warrant."

18 Coal Properties for Sale

McFarland-McFarland & Ranney, 241A Metropolitan Tower, New York City, recently issued a complete list of coal supply properties which are on the market for sale. If any company would be interested in owning any of the mines, the following list gives you complete data regarding quality, location, capacity, etc., and if further interested communication direct with the above company, which represents the owners, will give the information desired:

No. 1—Large operating mine near Wheeling, W. Va., mining at present 800 tons per day. Pittsburgh seam. Use stripping method with unusually low mining costs. At present rate earnings will pay back in three years purchase price. Capacity 1,000 tons per day.

No. 2—Operating mine near Morgantown, W. Va., at present mining 200 tons per day. Sewickly coal. Very good steam coal. Can be shipped by either railroad or river. Can be developed to 1,000 tons daily.

No. 3—1,000 acres Pittsburgh coal, Marion County, W. Va., seam 8 ft. to 9 ft. High-grade gas and coking. Shaft required, 175 ft. Accessible to both river and railroad.

No. 4—75 acres Pittsburgh coal on Pennsylvania Lines, 28 miles from Pittsburgh. Good steam coal. Coal outcrops at tipple height, permitting the opening of mine in short time at a minimum outlay.

No. 5—100 acres Pittsburgh coal on B. & O. R. R., east of Washington, Pa. Shaft 225 ft. necessary. High-grade gas coal.

No. 6—300 acres coal near Washington, Pa., on railroad. High-grade gas coal. Seam lies 20 ft. below surface and could be worked by short slope.

No. 7—600 acres Pittsburgh coal near Washington, Pa., 1½ miles

from B. & O. R. R. Steam coal. Good investment.

No. 8—575 acres of good steam and gas coal, Pittsburgh vein, near Washington, Pa., near Pennsylvania Lines. Shaft required.

No. 9—11,000 acres of steam coal, Pittsburgh vein, in Washington County, Pa. Will front on two railroads soon.

No. 10—257 acres of Pittsburgh coal, east of Washington, Pa., near B. & O. R. R. Excellent gas coal. Shaft required.

No. 11—1,000 acres of Pittsburgh coal on Wabash Railroad in Washington County, Pa. Steam coal. Drift mining.

No. 12—2,000 acres Pittsburgh coal, Washington County, Pa., on projected railroad. Excellent coking coal.

No. 13—3,000 acres Freeport coal near Morgantown, W. Va., on Pennsylvania Railroad and Monongahela River. Very high-grade coking coal; about river level.

No. 14—200 acres stripping coal near Steubenville, Ohio. Pittsburgh vein. Steam coal. Overburden 22 ft.; 200 acres drift coal adjoining.

No. 15—456 acres near Steubenville, Ohio, on railroad. Pittsburgh and Freeport coal, now being coked. Drift mining required.

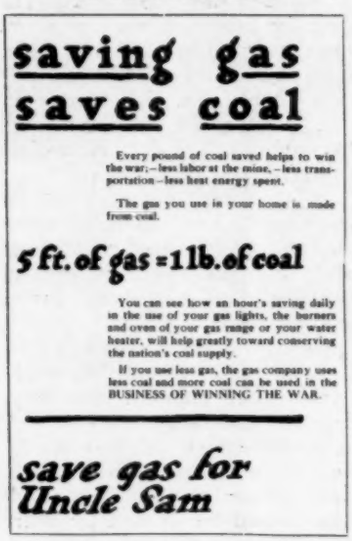
No. 16—600 acres, Washington County, Pa., on projected railroad. Pittsburgh coal. Excellent quality gas and coking. Shaft required.

No. 17—100 acres, Washington County, Pa. Pittsburgh steam. Stripping or drift.

No. 18—543 acres, Beaver County, Pa., on railroad. Excellent steam coal, equal to the best stripping coal in Ohio. Cost of stripping 20 cents to 30 cents per ton. Freight to Cleveland 70 cents, much less to Pittsburgh. Excellent clay, much timber. Four houses and barns.

The above notice has been sent to all members of the Michigan Gas Association.

Newspaper Publicity on Conservation of Gas


saving gas saves coal
Every pound of coal saved helps to win the war;—less labor at the mine,—less transportation—less heat energy spent.
The gas you use in your home is made from coal.
5 ft. of gas = 1 lb. of coal
You can see how an hour's saving daily in the use of your gas lights, the burners and oven of your gas range or your water heater, will help greatly toward conserving the nation's coal supply.
If you use less gas, the gas company uses less coal and more coal can be used in the BUSINESS OF WINNING THE WAR.
save gas for Uncle Sam

ONE OF THE ADS ARRANGED BY A SPECIAL COMMITTEE OF THE MICHIGAN GAS ASSOCIATION

Consumers at Concord, N. C. Notified of Increase by Letter

Working on the basis of creating the minimum amount of dissatisfaction among its consumers over the necessary rate increase, the Concord & Kannapolis Gas Company (N. C.) has found it advisable to circulate the following letter:

"In view of the fact that this company has been compelled to operate at a very material loss, due to the increase in cost of materials and other expenses involved in the manufacture of gas which has come upon us through conditions over which we have no control, the city council of Concord has authorized a temporary increase in the selling price of gas, effective Jan. 1, 1918.

"The new rate will be $1.85 per thousand cubic feet, less the usual discount of 10 per cent if paid on or before the 10th of the month.

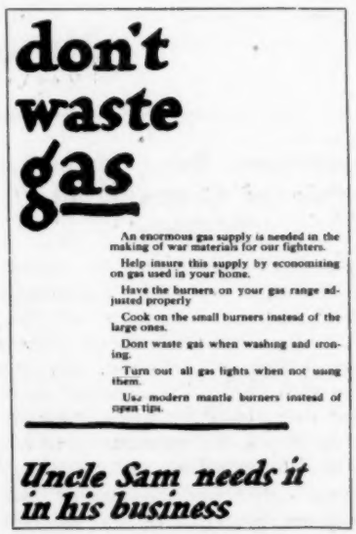
"It was plainly evident that the present efficient service and good quality of gas could not be maintained at the old prices under the existing circumstances. It was, therefore, a question of decreasing the service and quality or slightly increasing the price. The city council, at our request, has authorized the latter, and has stipulated that the present high standard be maintained. This we will always endeavor to do, and in this connection we will be glad to have you phone us at any time if your service or appliances are not entirely satisfactory in every way.

"Assuring you of our appreciation of your patronage and hoping to continue to serve you as in the past, we are

"Yours very truly,

"CONCORD & KANNAPOLIS GAS COMPANY,

"J. S. Palmer, Manager."


don't waste gas
An enormous gas supply is needed in the making of war materials for our fighters.
Help insure this supply by economizing on gas used in your home.
Have the burners on your gas range adjusted properly
Cook on the small burners instead of the large ones.
Dont waste gas when washing and ironing.
Turn out all gas lights when not using them.
Use modern mantle burners instead of open tips.
Uncle Sam needs it in his business

ANOTHER OF THE STRIKING ADS AIMED TO HELP COMPANIES CONFRONTED WITH GAS SHORTAGE

Capital Increase Filed by Waterbury, Mass., Company

The Waterbury Gas Light Company has filed in the Secretary of State's office a certificate for the increase of its capital stock from $1,500,000, divided into 60,000 shares of common stock of the par value of $25 each, to $1,800,000, divided into 72,000 shares of common stock of the par value of $25.

Priority Order Set for Cincinnati Gas Service

The investigation made into the Cincinnati gas situation by C. V. Critchfield, gas expert of the Ohio State Public Utilities Commission, has resulted in the State commissioner issuing an order for the curtailment of service, based upon the classifications agreed upon between him, City Solicitor Groom and officials of the Union Gas & Electric Company. The order in which the various classifications are to be curtailed in case of shortage, under the State board's ruling, is as follows: (1) Industrial consumers using gas in boilers, furnaces or in manufacturing and industrial processes; (2) consumers using gas for heating in buildings and offices and establishments other than private residences; (3) gas engines; (4) restaurants, hotels, clubs and dining rooms.

Fuel Situation So Acute as to Demand Priority Schedule

During the extremely cold weather that featured the month of December the fuel authorities of Indiana had to be called into the breach to assist the Citizens' Gas Company, which suddenly found its mains supplying such an unusual amount of gas to the citizens of Indianapolis that continued draining would have meant eventual failure of the product. Such a condition had been foreseen earlier in the year, when the price of coal began to shoot up and the price of gas remained stationary. Many warnings were issued by the company.

When below-zero weather came on in December it was found necessary to ask assistance from Evans Woollen, Federal fuel administrator for Indiana, Mayor Joseph E. Bell of Indianapolis, and E. I. Lewis, chairman of the public service commission. These three authorities (perhaps the public service commission carried the greatest weight, since it could govern service by the company legally) finally were compelled to fix a priority schedule for the use of gas, in a letter to the Citizens' Gas Company, as shown in the next column.

The company's explanation of the situation was as follows:

The priority order was issued by the fuel administrator, the Mayor and the chairman of the public service commission because we reported to the public service commission that the demand which was made on us for gas for heating purposes on Saturday night, Sunday and Monday morning was entirely beyond our ability to supply. In order to avoid having the gas mains entirely drained it was necessary to reduce the amount sent out, which resulted in very poor service to a great many consumers who were not in any sense responsible for the situation. As soon as people got up on Sunday morning they lighted up every gas burner in their houses and the gas began to go from our plants at the rate of 850,000 cu. ft. per hour. The maximum output of all of our equipment working under perfect conditions is 500,000 cu. ft. of gas per hour, and it would never be possible for us to maintain this rate of production for a period of twenty-four hours. The slightest interference with perfect operating conditions, such as the failure of a railroad to set some cars of coal at the time expected, always reduces the maximum output to a very considerable extent.

If gas is used only for the five purposes for which the public authorities have given priority orders, there will be plenty of gas to meet all of these demands. It is our understanding of the priority order that if a shortage shall develop at any time, persons using gas for the purposes lowest down on the list must discontinue the same immediately. For example, all industrial uses of gas would have to stop first; but if there should not be enough after that for cooking, lighting and water heating, then the fourth class of

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CITIZENS GAS COMPANY, Indianapolis, Indiana:

Complaints from all parts of the city indicate a critical shortage of gas. Investigation reveals that the demand on your facilities exceeds the supply. Investigation further reveals that you were unable during the war period this year to increase those facilities. It further indicates that if the supply of gas is exhausted in the city mains the city will be deprived of gas supply for thirty days or more.

The situation confronting a city of this size calls for drastic action.

Your first obligation is to the domestic consumers of Indianapolis. It was to serve them that you were organized and given a franchise. They must have the supply before anyone else, but conditions must be created under which they cannot abuse their gas privileges.

After the plant was constructed for domestic uses, manufacturing concerns have come on to your mains. Operation of some plants is now dependent on gas supply.

Conditions are so serious as to warrant a strict priority order under which you shall supply gas to the people of Indianapolis.

The Federal Government has already indicated in the matter of coal that the small consumer must be cared for first. This priority theory should apply to the gas situation in Indianapalis.

The priority, therefore, should be as follows:

1. Cooking.
2. Lighting.
3. Domestic water heating.
4. Heating of rooms for which no other appliances now exist and where gas was used for heating in the year 1916.
5. Industrial purposes, but only to the extent to which gas was supplied in the corresponding months of the year 1916.

If there is a surplus beyond these requirements, then gas may be supplied for other domestic and industrial purposes.

The city lighting should be reduced by one-half.

All private outside lights should be discontinued.

In carrying out the foregoing priority rules you are instructed to inspect all premises where gas is being used and warn all consumers against the use of gas in violation of the foregoing rules.

You are instructed to cut off and seal the connections of all heating appliances and all industrial appliances for which gas cannot be supplied under the foregoing priority order.

You are especially further instructed to prohibit consumers from using cooking appliances for heating purposes and to advise all consumers that appliances designed for water heating, light or industrial purposes should not be used for the heating of houses or parts thereof.

In cases where there is non-compliance with this order you are instructed to cut off all supply of gas at the street.

A crisis confronts the city.

In issuing this order to the gas company, the citizens of Indianapolis are also called upon to co-operate to the fullest extent in securing compliance. They will thus prevent the disaster to the city of being deprived of a gas supply for a period of thirty days or more, as would be the case in the event that the mains should be emptied.

JOSEPH E. BELL, Mayor, City of Indianapolis,
E. I. LEWIS, Chairman, Public Service Commission of Indiana,
EVANS WOOLLEN, Federal Fuel Administration of Indiana.

users of gas would have to give up the service. The great difficulty, however, does not come from the use of gas for any of these purposes, but from its use for the purposes which are forbidden in this priority order, except when there is a surplus after a full supply for the five purposes named. Perhaps the greatest of all abuses of gas privileges comes from the use of cook stoves for heating purposes. There are 50,000 of these appliances in the city, and the use of all of them for a period of about two hours in a day in excess of the requirements for cooking means an increase in the gas consumption amounting to 5,000,000 cu. ft. in that day. Next to the misuse of kitchen ranges comes the excessive use of room heaters, grates, etc., which were not intended to furnish complete heat for the places where they are located, but only a little supplementary heat. When persons are without coal or are using it very sparingly during severe weather, their use of these small heating appliances will overtax the capacity of the plants.

The priority order directs the gas company to inspect all premises and seal connections to appliances which are being used in such a way as to endanger the gas supply of the city. We will begin this inspection immediately, and trust that it will thus be possible to check further drains of the character which occurred Sunday. Since a very great waste is caused by the use of kitchen ranges, the priority order instructs us to cut off the supply of gas at the street where these appliances are being used for heating purposes. This would be a great misfortune to any family, and we trust it will not be necessary to take this step in any case; but it would be better to deprive families who are using their kitchen stoves for heating purposes of their entire supply of gas for cooking and other unauthorized uses than to have the whole city deprived of gas. It would be a terrible thing for any large city to have the gas supply cut off, for it would be impossible for any large proportion of the population to find means for preparing food. The stocks of prepared foods in the stores would soon be exhausted, and it would be impossible to substitute coal stoves or oil stoves for gas ranges in any large proportion of the kitchens. An absolute failure of gas and the emptying of the pipes would entail a very great interruption to the service, because it will be necessary to inspect practically every burner in the city before gas could be turned on again and also to assist consumers in clearing their pipes of air. In normal times we do not believe this could be done in Indianapolis in less than sixty days, and with the present scarcity of skilled men able to do this work the time required would be very much greater.

Naturally, the gas company wants to sell all of the gas it can produce. It would be foolish for it to do anything to limit the consumption of gas except to meet the unparalleled emergencies of this time of fuel scarcity. Unfortunately, it is impossible for the gas company to increase its capacity, and even if it were able to do so the city would not require such increased equipment for a great many years to come and would not be willing to pay the increased price for gas which would be required to cover this idle investment. To meet the increased demands of Sunday morning would require an investment of $2,000,000, and even if the company could raise the money for this purpose it would be impossible to get the required equipment completed in less than two years under present conditions. Therefore, the only safeguard for the community is to forego the use of gas as a substitute for coal for general heating purposes. If the public generally will co-operate with the gas company in carrying out the priority order which has been issued to it, there will always be plenty of gas for the purposes indicated in this order. We hope that it will not be necessary to cut off the supply of gas for a single consumer. If we are obliged to do so it will be done reluctantly, and only because such a step is required for the safety of the whole community.

Hoosick Falls Gas Plant Sold

The property of the Fidelity Gas Company, Hoosick Falls, N. Y., was sold at foreclosure recently for $5,000, to John J. Duffy, of Jersey City, a former official of the company.

Bartlesville, Okla., Decided Upon for Experimental Station

Secretary of the Interior Lane has designated Bartlesville, Okla., as the location of the new experimental station of the Bureau of Mines for the investigation of problems relating to the petroleum and natural gas industries. The station is one of three new experimental stations for the establishment of which the sum of $75,000 was appropriated by the last Congress. The two other stations have been located at Minneapolis, Minn., for the study of iron and manganese problems and at Columbus, Ohio, for research connected with the ceramic and clay-working industries.

The selection of Bartlesville was due to its location in the heart of the great mid-continent oil and gas fields. The selection was influenced also by the offer of a free site and by the raising of $50,000 by the citizens of the town. This sum of money will be applied to the building of offices and laboratories and the purchase of engineering and chemical equipment.

The technical staff of the new experimental station will study various problems having practical commercial application to the petroleum and natural gas industries, including questions of production, transportation, storage and refining of petroleum, and various problems connected with the technology of natural gas.

It has been the policy to establish experimental stations in different parts of the United States where various phases of the mining industries could be studied at first hand, such stations likewise serving as centers for keeping in close touch with the practical needs of the industries throughout the country.

Though emphasis is to be laid on the practical side of the industry, some misconception may exist in the minds of many about what is of practical importance. In many phases of the industry, basic elementary facts necessary for the development of new processes or the increasing of efficiency in established processes are lacking, and in such cases it may be desirable to carry out investigations that are not in themselves directly practical, though they will provide the knowledge upon which commercial results of tremendous value may be founded. Such investigations have provided the foundations for advancements made in engineering

and in many industries, and without them the wonderful strides made in our present civilization would have been impossible.

One of the greatest needs of the petroleum industry has been the coordination of scientific research with the practical side of the industry, for compared with other mineral industries it has been singularly backward in this respect. Seldom does the practical man in the oil business realize how much of his everyday work, his tools and equipment are derived directly or indirectly from the most scientific and abstruse technical and engineering investigations.

The station is aimed to act as an intermediary between the facts evolved by scientific investigations and the needs of the oil industries. That is, men will be employed who will be able to gather scientific data and find out how they may be applied to the practical needs of the industry.

The problems that may be attacked in such a station are endless. When one begins a close study of the industry, new problems and new means for increasing efficiency continually disclose themselves. In considering the problems presented, the difficulty will not be in finding problems, but in determining which problems should best be attacked first. Methods for extracting more oil from the oil sands, for determining the best spacing of wells, for estimating the future production of wells, for solving water problems, for reducing the evaporation losses in the field, in storage and in the refineries, dehydration of oils, cracking methods, reduction of fuel consumption and heat losses in refineries, and the recovery of gasoline from natural gas are but a few of the endless problems about which inquiries are made of the bureau every day by men in commercial life.

In order to make the work of this station most useful, continual cooperation will be needed from the industry. This means encouragement and recognition of the work going on, aiding the men with advice and information, suggesting problems, and at times co-operating in practical tests on the properties or in the plants of operating companies. The amount of benefit that the industry as a whole and each individual will derive, will depend largely on the encouragement and assistance rendered the station. It is, therefore, largely dependent on the industry itself how successful this experimental station will be and how much the members of the industry will individually and collectively be benefited.

Athens, Ga., Increase Petition Granted

The Georgia Railroad Commission has granted the petition of the Athens Gas Light & Fuel Company for permission to increase its rates to 15 cents a cubic foot. There was no opposition to the petition, which was favored by the city officials and the public of Athens.

The application of the Consumers' Gas Company, of Waycross, for authority to issue $15,000 bonds for improvements was granted the day following a recent hearing.

THE CITIES SERVICE COMPANY earnings continue to expand at a remarkable rate, even though large reserves have been created to provide for the estimated excess profits taxes. The earnings for the month of November were the largest reported this year, with the single exception of January. The gross earnings for last month amounted to $1,732,413, as compared with $1,328,389 in November, 1916, an increase of $404,024, or more than 30 per cent. The gross earnings for the twelve months ending Nov. 30, 1917, were $19,110,629, an increase of $10,038,910, or 111 per cent. After deducting expenses, interest charges and preferred stock dividends, there remained a balance for common stock and reserves of $15,102,348, an increase of $8,829,860, or 141 per cent. This is equal to $61.09 on each share of common outstanding, compared with $33.08 last year. The preferred stock dividends were earned 5.13 times, compared with 3.77 times. The total surplus and reserves were $22,597,907, and the earnings available for reinvestment in the properties were $27,056,138, $1,247,682 being added during the month.

Societies and Associations

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, which includes in its membership 8,500 mechanical engineers, at its most recent meeting elected Charles T. Main, a consulting engineer of Boston, as president. Mr. Main has served in several public offices for the purpose of advancing the idea of good government. He was born in Marblehead, Mass., in 1856, and was educated at the Massachusetts Institute of Technology, from which he was graduated in 1876. Three years later, after continuous service in the Institute as assistant in the department of mechanical engineering, he became a draftsman at the Manchester Mills, Manchester, N. H., leaving this concern in 1881 to enter the employment of the Lower Pacific Mills, Lawrence, Mass., where for eleven years he acted in the respective capacities of engineer, assistant superintendent and superintendent. Since 1892 he has practiced as a consulting engineer, with offices in Boston, until 1907, being associated with F. W. Dean in the firm of Dean & Main. Mr. Main has designed and supervised the construction of numerous industrial, steam-power and water-power plants, among his largest undertakings being the Wood Worsted and Ayer Mills in Lawrence, Mass., and four hydroelectric developments for the Montana Power Company, aggregating about 280,000 hp. Mr. Main became a member of the American Society of Mechanical Engineers in 1885, and has served on its board of managers for the past three years. He is also a member of the American Society of Civil Engineers and a number of other engineering and technical societies.

THE FALL RIVER (MASS.) GAS WORKS COMPANY EMPLOYEES' ASSOCIATION held its first meeting of the year in the clubrooms of the company on North Main Street. About 125 members were present and gave the season activities a rousing start. Under the very competent direction of Charles Silverwood, a fine chowder was prepared, together with all the fixings. After the supper a short business meeting was held. Robert B. Clark, superintendent, Charles Silverwood and A. A. Chamberlain, the retiring president, vice-president and treasurer, were succeeded by E. R. Hamilton, Edward Stebbins and Joseph Kavolsky. Robert Dreghorn, the secretary, was re-elected for another year. Excellent music was furnished by a trio consisting of George H. Lumley, pianist, Chester Allinson, cornetist, and

James Furneri, violinist, and an Edison phonograph. Mr. Gilbert, assistant to the manager of the company, was presented with a box of cigars, and Edward P. Burke with a silver cigarette case. The guest of honor was Sergeant Canby, of the French Ambulance Service Corps. Mr. Canby gave a most interesting talk about his experience over there, which was only too short. It was suggested by J. E. Nute, the manager of the company, and the presiding officer of the evening, that the members instead of paying their dues for the past year, join the Red Cross Society. He also stated that the office employees had joined the Red Cross 100 per cent strong, and he hopes to see the other departments do likewise.

THE ADVANCE CLUB, the organization of the employees of the Peoples Gas Light & Coke Company, of Chicago, was host to the 2,000 children of the more than 3,000 employees of the company at the club's third annual Christmas party on the afternoon of Dec. 22. The little ones were treated to a big feast, a good vaudeville show, and each was given a Christmas package of toys, candies and fruit. Following the custom of many previous years, the Peoples company this year again presented each of its employees with a Christmas turkey, notwithstanding the high prices of those birds.

Personal Notes

W. G. KAISER recently resigned his position as factory superintendent of the Western Gas Construction Company. A. Crowe, of Youngstown, Ohio, has been appointed to fill the vacancy and has already entered on his duties, as was noted in the Dec. 22 number of the AMERICAN GAS ENGINEERING JOURNAL. Mr. Kaiser is one of the veteran employees of the company, having started to work there when it was formed. He is a patternmaker by trade, and his knowledge of the work led to his being made factory superintendent several years ago, which position he has held up to the present time.

D. J. FLEMING, manager of the Wisconsin - Minnesota Light & Power Company, of Red Wing, Minn., has been advanced to the position of manager of the company, with headquarters at Eau Claire, Wis., where the corporation's head offices are located. The appointment of Mr. Fleming to the office of district manager of the Eau Claire district is in recognition of his valuable services to the corporation and is a distinct promotion for him. The new position carries with it a substantial increase in salary. Mr. Fleming took over the management of the business of the Red Wing office on Aug. 1, 1913, since which time extensive improvements have been made. He is succeeded at Red Wing by Fred Schornstein.

FRED SCHORNSTEIN, of Cleveland, Ohio, has been appointed manager of the Wisconsin-Minnesota Light & Power Company at Red Wing, Minn., succeeding D. J. Fleming. Mr. Schornstein has been in charge of the corporation's interests at Cleveland and is a man of wide experience in the gas and electric power business.

C. A. SCHLEGEL has recently been appointed manager of the Northern Indiana Gas & Electric Company, South Bend, Ind. Mr. Schlegel has been acting manager of the company for some time, succeeding C. N. Chubb, who resigned to go to Davenport, Iowa, as was noted in the Nov. 3 number of the AMERICAN GAS ENGINEERING JOURNAL.

C. H. ANDREWS, assistant to the president and chief engineer of the North Carolina Public Service Company, Greensboro, N. C., has been appointed general superintendent of the Southern Utilities Company, which corporation operates electric, gas and ice properties throughout Florida, under the management of the J. G. White Management Corporation, New York, N. Y. He will assume his new duties on Jan. 1. Mr. Andrews graduated from Purdue University, Lafayette, Ind., in 1908, receiving the degree of B. of S. in E. E. After graduation, he entered the employ of the Public Service Corporation of New Jersey, serving in the meter department of that company. In 1909 he became connected with the North Carolina Public Service Company. Soon after joining this organization he was appointed superintendent of the light and power department; later on he was made departmental manager of new business; in 1911 he was promoted to the position of assistant general manager, in charge of electric, gas and street railway utilities in Greensboro and High Point, N. C., and in 1917 his position was made assistant to the president and chief engineer. In connection with his general duties, Mr. Andrews has devoted much time with success to studying the question of rates and their application. He is a member of the American Institute of Electrical Engineers and of the American Gas Institute.

M. G. REYNOLDS, president and general manager of the Reynolds Gas Regulator Company, of Anderson, Ind., died Dec. 12. The company manufactures artificial gas governors and natural gas regulators for all kinds of pressure reduction, and will continue business under the management of J. C. Groble, vice-president and assistant manager.

R. J. RITCHIE, who for the last nine years has been manager of the Peoples Gas Company, of Shenandoah, Iowa, has recently been made general manager of the company. He has also been appointed general manager of the Shenandoah Artificial Ice, Power, Heat & Light Company. This combination besides supplying Shenandoah with gas, also has an up-to-date artificial ice plant; it likewise supplies steam heat to the major portion of that city.

J. A. FREEMAN, formerly of Villisca, Iowa, has been chosen assistant manager of the Peoples Gas Company and the Shenandoah Artificial Ice, Power, Heat & Light Company, both of Shenandoah, Iowa.

ROY N. BUELL, for many years superintendent of construction for the Parker-Russell Mining & Manufacturing Company, of St. Louis, Mo., has recently been elected general superintendent of manufacture of the Central States Gas Company, with headquarters at Vincennes, Ind. Mr. Buell starts on his new duties Jan. 1, 1918.

HARRY M. LIMBACH, for the last fifteen years a professor of chemistry in high schools of Louisville, Ky., was recently appointed gas inspector for Louisville by Mayor George Weissinger Smith to succeed Monroe J. Frankel, incumbent. Mr. Limbach is a graduate of the University of Michigan.

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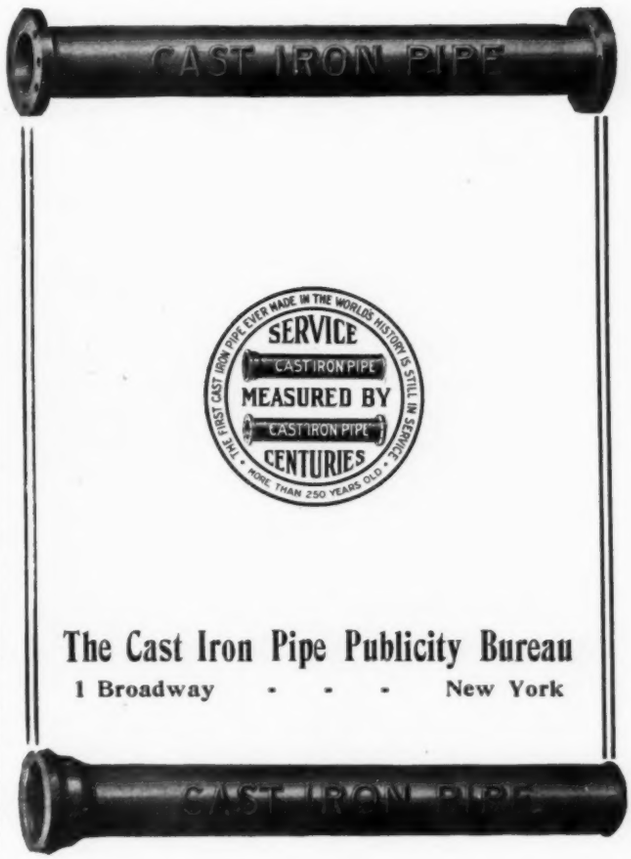
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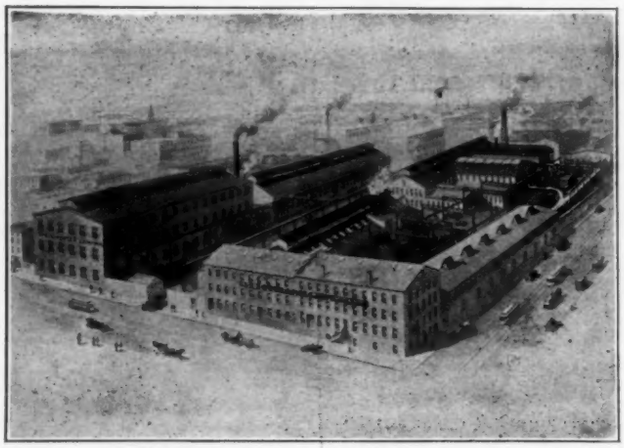

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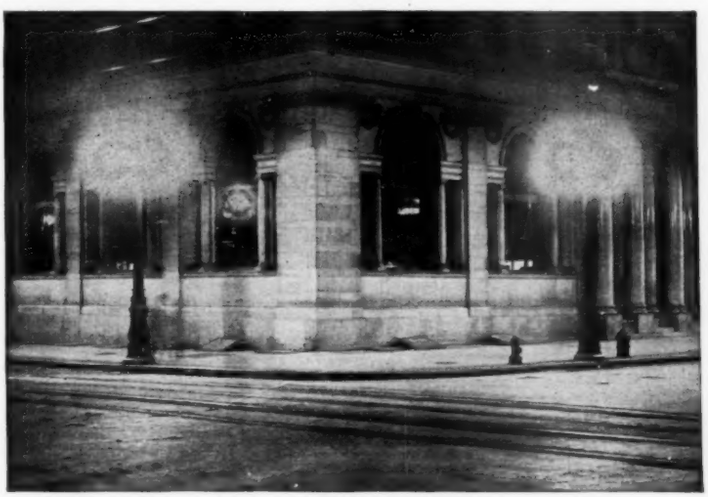

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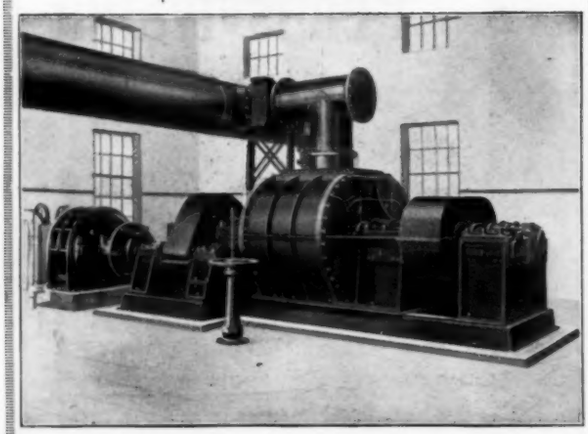

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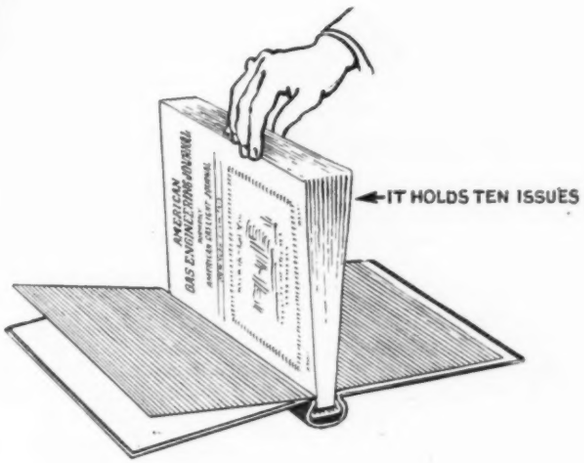

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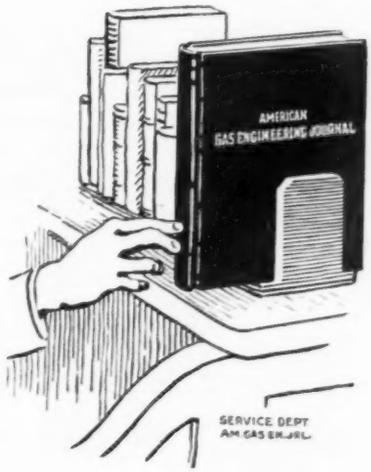

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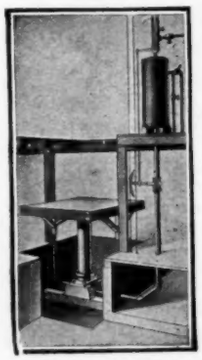

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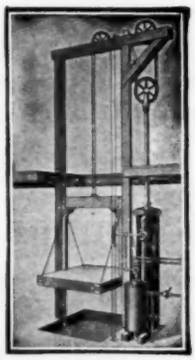

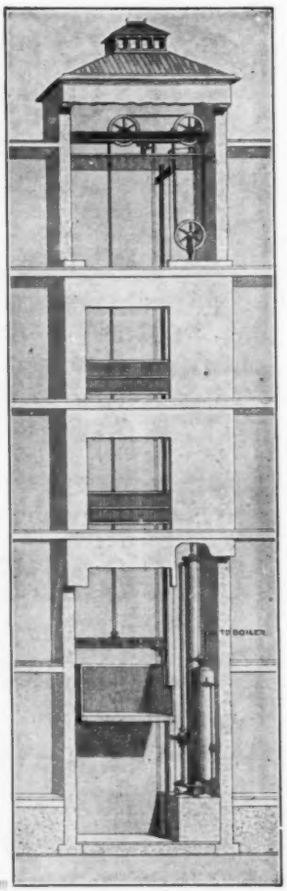

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ripe and ready along your mains right now than there has ever been before—This winter will bring lots of it.

Here is a unit—*The Humphrey Daylight Arc*—designed for factory service—and the most successful selling lamp that ever burned gas. You can build up a wealth of high rate business with this unit. We will help you. Write us today about your situation.

General Gas Light Company

New York Kalamazoo San Francisco

DEILY & FOWLER MFG. CO.

39 Laurel Street, Philadelphia, Pa.

ESTABLISHED 1842 BUILDERS OF INCORPORATED 1908

GAS HOLDERS

SMALL HOLDER IN STOCK

Absolutely new STEEL TANK HOLDER. 20,000 cubic feet capacity, practically ready for shipment. WRITE FOR PRICES.

OCEAN
WESTMORELAND
GAS
COAL

The uniformity and quality are backed by the service of our organization.

We mine—we ship—we serve.

The Berwind White Coal Mining Company

A. C. M. AZOY
General Agent and Manager
Gas Coal Department

No. 1 Broadway, New York City
AND
Commercial Trust Bldg., Philadelphia

R. D. WOOD & CO.

400 CHESTNUT STREET, PHILADELPHIA

MANUFACTURERS OF

Cast Iron Pipe

HEAVY LOAM CASTINGS

Dunham Specials
Hydraulic Work

LAMP POSTS, VALVES, ETC.

Gas Power Plants with Producers

BUILDERS OF

Gasholders

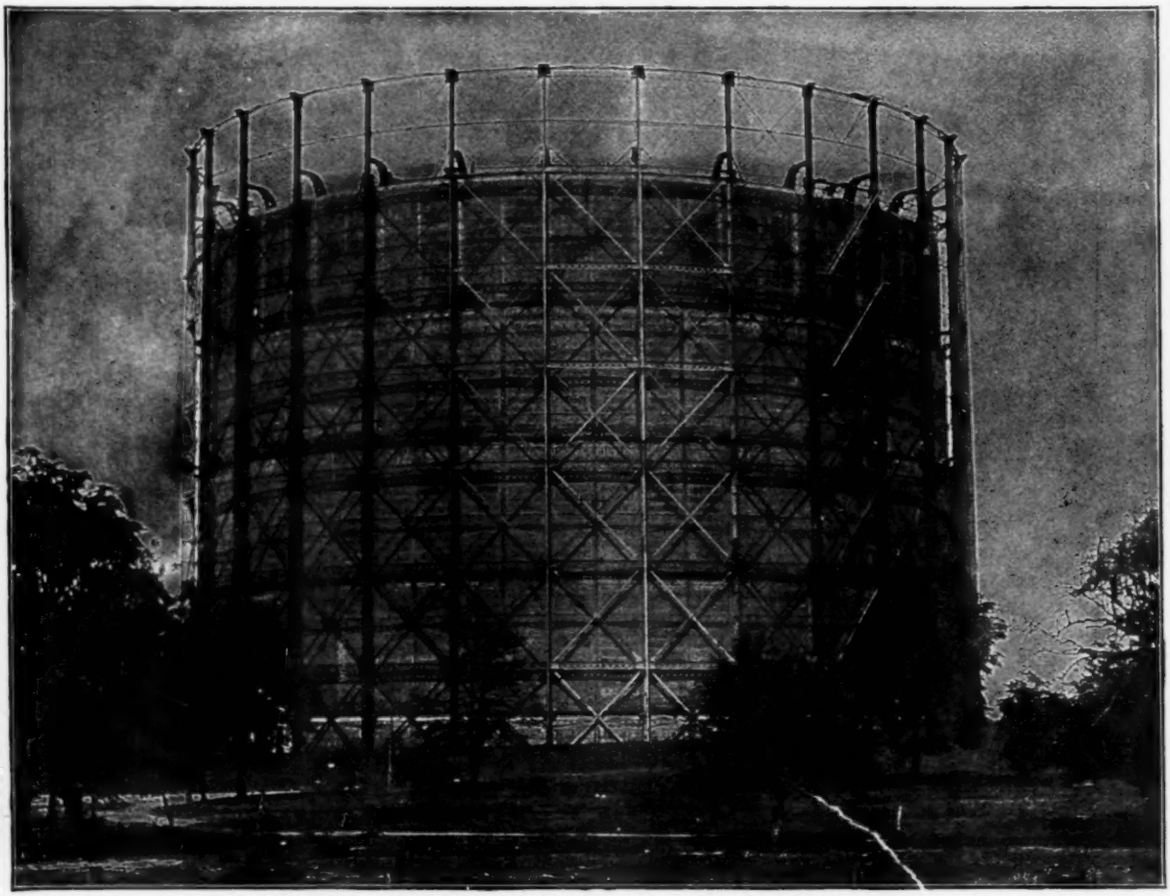
Single or Multiple Lifts, with or without Metal Tanks

Purifiers, Condensers
Scrubbers, Bench Work

Cutler's Patent Freezing Preventer for Holder Cups

THE LARGEST **GAS HOLDER** IN THE WORLD

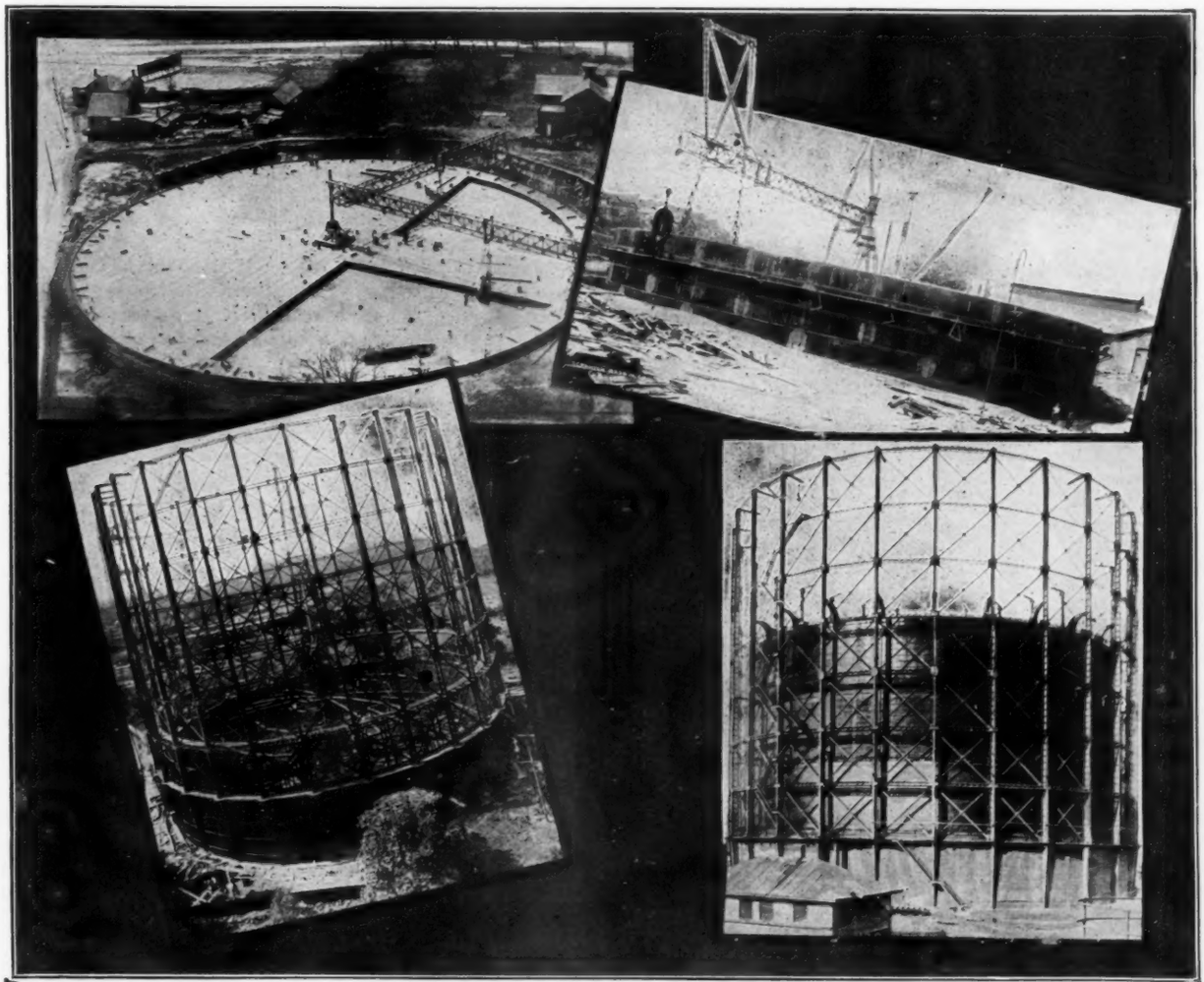
15,000,000 Cubic Feet Capacity



BUILT BY

THE BARTLETT HAYWARD CO.

BALTIMORE **NEW YORK**



RITER-CONLEY COMPANY

STEEL CONSTRUCTION

PITTSBURGH

GAS PURIFYING MATERIALS

NATRONA RED ORE
To Be Mixed With Fluffing Material

MINERAL SPONGE
The Best Fluffing Material

MINERAL SPONGE OXIDE
Prepared For Use

PENNSYLVANIA SALT MFG. CO.
WIDENER BUILDING
PHILADELPHIA - - - - - - - PENNA.

Financial Notes

THE COLUMBIA GAS & ELECTRIC COMPANY, through its treasurer, T. F. Wickham, announces consistent increases in its earnings in the monthly statement for May. The statement of consolidated earnings and expenses of the Columbia company and its subsidiaries shows:

	For May, 1917.	Increase.
Gross earnings..	$861,625.06	$202,717.92
Operating expenses	417,689.08	73,931.90
Net operating earnings	443,935.98	128,786.02
Other income ..	162,822.25	118,274.46
Total net earnings and other income	606,758.23	247,060.48
Lease rentals, etc.	289,571.36	9,167.87
Fixed Charges—Columbia Gas & Electric Co...	59,833.33	873.23
Surplus	257,353.54	237,019.38
For Five Months Ended May, 1917—		
Gross earnings..	$4,944,438.21	$807,989.94
Operating expenses	2,282,544.93	347,743.47
Net operating earnings	2,661,893.28	460,246.47
Other income ..	806,555.30	608,573.52
Total net earnings and other income	3,468,448.58	1,068,819.99
Lease rentals, etc.	1,432,927.78	31,217.54
Fixed Charges—Columbia Gas & Electric Co...	299,048.90	11,716.37
Surplus	1,736,471.90	1,025,886.08

THE AMERICAN GAS & ELECTRIC COMPANY has declared an extra dividend of 2 per cent. in common stock, in addition to the regular quarterly 2½ per cent. on common and 1½ per cent. on preferred, common payable July 2, preferred payable Aug 1.

THE PORTLAND GAS LIGHT & COKE COMPANY reports that in May the net earnings declined 4 per cent compared with May, 1916, although gross earnings were greater. Operating expenses advanced 12 per cent. For the 12 months closed May 31 the net earnings increased 1 per cent and operating expenses increased 5 per cent.

Summarized, the financial reports for the two periods show as follows:

	May, 1917.	Twelve Months.
Gross earnings.....	$102,617	$1,279,143
Operating expenses...	59,679	676,553
Net earnings.....	$42,938	$602,590
Balance after deducting all fixed charges...	$16,131	$276,544

THE BOSTON CONSOLIDATED GAS COMPANY'S directors have declared a dividend of 1 per cent, which makes a total of 7 per cent paid for the fiscal year ending June 30. This is 2 per cent less than the company is entitled to pay under the sliding scale act, and is 1½ per cent less than was paid last year.

THE LACLEDE GAS LIGHT COMPANY has recently issued a report showing in detail the financial operations of the company. The net earnings of the company, as shown by the report, are very large, but they do not include interest on bonds and dividends on stocks. The company deducts from its gross earnings its operating expenses and taxes and figures the balance as net earnings. According to the statement the net earnings for 1916, figured on this basis, were $2,486,695, which was approximately 55 per cent of the gross earnings of $4,509,424.

The report shows a total capitalization of $37,050,000, of which $10,000,000 is in 5 per cent gold bonds; $10,000,000 in refunding and extension 5 per cent gold bonds, $3,850,000 in debenture bonds, $2,500,000 in preferred stock and $10,000,000 in common stock.

Dividends of 5 per cent have been paid upon the preferred stock, and 7 per cent on the common stock since 1911, with a special 10 per cent dividend last January. The average dividends on the common stock since 1898 have been 4.30 per cent.

The gross annual income is given as follows: 1913, $4,533,491.36; 1914, $4,629,689.10; 1915, $4,577,731.32; 1916, $4,509,424.20, and for the first four months of 1917, $1,577,035.11. Of the 1916 income, $3,941,271.45 was derived from the sale of gas, $448,099.78 from electricity and $120,052.97 from by-products.

The net earnings were : 1913, $2,054,044.87; 1914, $2,105,576.91; 1915, $2,231,382.41; 1916, $2,486,695.27, and for the first four months of 1917, $744,527.32.

The sales in cubic feet of gas were: 1913, 5,091,218,300; 1914, 5,205,345,500; 1915, 5,157,648,300; 1916, 5,159,903,300. Of the gas sold in 1916, 2,215,534,000 was at 80 cents a thousand cubic feet; 1,627,225,000 at 75 cents; 401,244,800 at 60 cents; 89,153,100 at 55 cents; 30,401,700 at 50 cents, and 203,049,700 at 45 cents.

A rate of 75-55-45 cents went into effect in July, 1916, as the result of an agreement between the company and city officials, permitting the company to change the standard from a candle-power to a British thermal unit basis. The old rate was 80, 60 and 50 cents.

The report shows in detail the amount of coal and oil consumed in the manufacture of gas and the amount and value of by-products, such as coke and breeze, coal tar, ammonia, water, gas tar, light oils and carbon.

Much of the company's present by-products is used for war purposes, at a high price, but when the war is over will have little value. The company has agreed to sell toluol to the Government, for war purposes, for $1.50 a gallon, although the price until recently has been $3.25 a gallon.

Owing to the reduction of gas prices last year, consumers are saving about $300,000 a year. Not a complaint has been made on account of the change of standard from candle power to heat units.

THE WESTERN STATES GAS & ELECTRIC COMPANY, a subsidiary of the Standard Gas & Electric Company, has been authorized by the railroad commission of California to use $116,993 of the proceeds from the sale of its $1,564,000 of 10-year 6 per cent debentures during the months of August, September, October and November, 1916. The commission's order further provides that $312,474 of the proceeds of the debentures may be issued to pay for construction expenses incurred during the year ending Nov. 30, 1917.

THE NEW BEDFORD GAS & EDISON LIGHT COMPANY'S stockholders voted on June 22 to authorize the 6 per cent five-year debenture bond issue of $1,500,000 which the directors recommended. There was a good representation of stock at the meeting, and no opposition to the issue was expressed.

THE NEW YORK MUTUAL GAS LIGHT COMPANY has declared a semi-annual dividend of 5 per cent, payable July 10, to holders of record June 25. A dividend of 4 per cent was paid January 10 last.

CLASSIFIED ADVERTISEMENTS

Rate **$2.00** per inch for first insertion, **$1.50** per inch for each additional insertion of same copy. Positions wanted—**$1.00** per issue.

POSITIONS WANTED

DO YOU NEED A RELIABLE MANAGER?—Position wanted as manager of a gas plant; 20 years' experience; can furnish best of references. Address "Experience," care of the AMERICAN GAS ENGINEERING JOURNAL.
6-30-2

WANTED—Position by a first class meter repairer and prover. Married, 32 years of age and 15 years experience. Can furnish best of references. Address "W. C. H.," care of the AMERICAN GAS ENGINEERING JOURNAL.
7-7-1

POSITIONS OPEN

WANTED—Foreman for coal and water gas plant in eastern Massachusetts. Must be a mechanic and able to handle men. Give references and state wages expected. Address "E. M.," care of the AMERICAN GAS ENGINEERING JOURNAL.
6-2-t.f.

NIGHT FOREMAN WANTED. Coal and Water Gas. Must be able to handle stokers. Center of Michigan. Address "Night Foreman," care of the AMERICAN GAS ENGINEERING JOURNAL.
6-30-1.

DIVIDEND NOTICES

Office of

The United Gas Improvement Co.

N. W. Corner Broad and Arch Streets.
Philadelphia, June 13, 1917.

The Directors have this day declared a quarterly dividend of two per cent. ($1.00 per share), payable July 14, 1917, to stockholders of record at the close of business June 30, 1917. Checks will be mailed.

I. W. MORRIS, Treasurer.

DIVIDEND NOTICE
of the
AMERICAN LIGHT AND TRACTION COMPANY

The Board of Directors of the above Company, at a meeting held July 3, 1917, declared a Cash Dividend of One and One-Half (1½%) per cent. on the Preferred stock, a Cash Dividend of Two and One-Half (2½%) per cent. on the Common stock and a dividend at the rate of Two and One-Half (2½) shares of Common stock on every one hundred (100) shares of Common stock outstanding, all payable August 1, 1917. The Transfer Books will close at 12 o'clock noon on July 14, 1917, and will reopen at 10 o'clock A. M. on August 1, 1917.

C. N. JELLIFFE,
Secretary.

Our Special Interest in helping gas men to find the position best suited to them has developed into a **"Service."**

Learn More About It

American Gas Engineering Journal

MISCELLANEOUS

FOR SALE—1 Maryland meter 250 light No. 721591, 1 Maryland meter 250 light No. 754298, $100.00 each. Wisconsin-Minnesota Light & Power Co., La Crosse, Wis.
7-7-4

ESTABLISHED 1856

HENRY MAURER & SON

Manufacturers of

High Grade Firebrick, Blocks, Tiles, Etc.

WORKS: MAURER, N. J.

OFFICE: 420 E. 23d ST. N. Y. CITY

UTILIZE YOUR GAS LIQUOR

NO EXTRA LABOR OR OPERATING EXPENSES

IMPROVED AMMONIA CONCENTRATOR

About 130 in use. Write to

STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, Detroit, Mich.

KELLER ADJUSTABLE COKE CRUSHER

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER
COLUMBUS, IND.
Correspondence Solicited

Wiederhold Mantle & Burner Co.

Manufacturers of

HIGH-GRADE MANTLES

Write for Samples and Prices

131-133 Winfield Ave., Jersey City, N.J.

Valve in Position

PREVENTS A REVERSE FLOW OF GAS

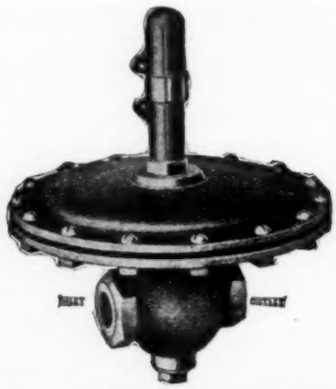
For use on lines using boosted air pressure.

Connelly Back Pressure Valves on your high pressure lines will prevent all trouble and a positive gas-tight check to any back pressure or reverse flow of gas—acts automatically—sensitive to the slightest impulse—easily accessible.

Connelly Iron Sponge & Governor Co.

NEW YORK CHICAGO SAN FRANCISCO

Anything and everything for the manufacture and distribution of gas



The FULTON

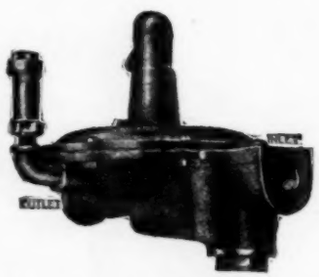
House Service Regulator

(Spring Style)

The Valve in this regulation is opened by a spring instead of lever and weight.

It is strongly and durably made. The spring can be adjusted to deliver a given pressure and the spring-case can be locked and sealed.

It will reduce any intake pressure up to 100 pounds to a delivery pressure of a few ounces; size from ¾-inch inlet and outlet to 1½-inch inlet and outlet.



This FULTON SENSITIVE GOVERNOR is for high pressure service lines connecting users directly with the high pressure mains.

It will control any high pressure on the inlet side up to 100 pounds and deliver any desired outlet pressure from 2 inches water to 6 ounces.

IT WILL HANDLE ANY FORM OF MANUFACTURED GAS

Our thirty years of gas regulator experience is always at the service of our customers.

Illustrated Catalog, showing all styles, on request.

The Chaplin-Fulton Mfg. Co.

Pittsburgh, Penna.

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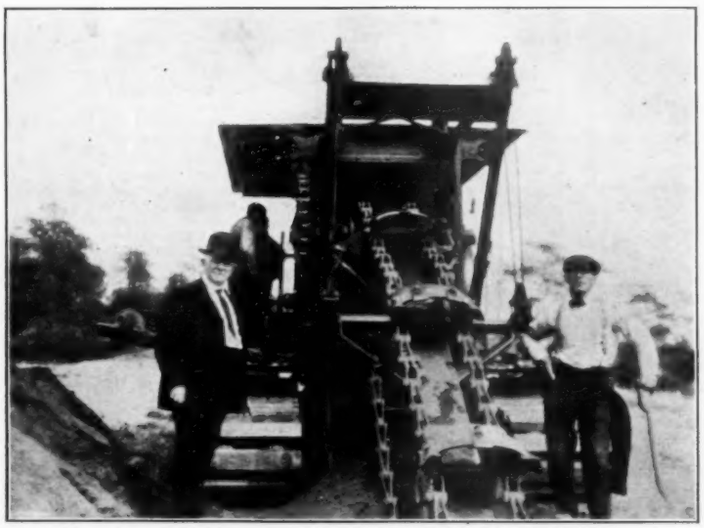
BE FREE As You Can From Labor!

PARSONS EQUIPMENT REDUCES YOUR LABOR GANG TWO-THIRDS



James McAvoy, Contractor, New York City, operating his all-steel Model 36 Parsons Trench Excavator, laying 12" C. I. pipe in Long Island City.

Note the sturdy lines of this machine.

Isn't it a perfect model of compactness? The heavy driving shafts and machinery are centered right over the broad base Parco Traction. In hard digging there's no tendency of the machine to "tip up"—*it lays right up against the job.*

Model.	Width to cut.	Depth to cut.	Engine.
18	12" to 18"	to 6'	21 HP.
24	15" to 24"	to 10'	28 HP.
36	18" to 36"	to 15'	45 HP.
48	24" to 48"	to 18'	62 HP.

Write for catalogue just off the press. Back Filler Catalogue also.

THE PARSONS COMPANY
Home Office and Works, 616 6th St., Newton, Iowa
Eastern Sales Office, 18 West 34th St., New York City

Gas Street Lighting Talks No. 4

In the words of the President of the N. E. L. A., "Light for our streets and homes provides the most effective protection against disorder and crime which the unsettled condition may incur."

As manufacturers of the most dependable illuminant known, Gas Companies must recognize public lighting as a patriotic duty in these times. Homes and industries must be protected—"do your bit" with us in demonstrating that protection is positive where gas lighting prevails.

Welsbach Street Lighting Company of America
1934 Market Street :: :: :: Philadelphia

Established 1858 *Incorporated 1890*

CHAS. E. GREGORY, President — DAVID R. DALY, Vice-President and Treasurer — H. D. ABERNETHY, Secretary

J. H. GAUTIER & CO.

Jersey City, N. J.

COAL GAS BENCHES

Silica Retorts and Settings

Clay Gas Retorts Fire Brick

Water Gas Linings, etc.

GOODMAN STOPPER

The Half Minute

GAS MAIN SHUT-OFF

AWARDS

A SILVER MEDAL, St. Louis, 1904

A GOLD MEDAL, San Francisco, 1915

MANUFACTURED AND SOLD BY Safety Gas Main Stopper Co.

90 Alexander Avenue, near 133rd Street, New York

"EVERYTHING FOR A GAS PLANT"

The Western Gas Construction Co.

Fort Wayne, Ind.

No Work Too Special

No Demands Too Exacting

LET US SERVE YOU

GEROULD'S IMPROVED RETORT CEMENT

The Old Reliable

A cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. THOMPSON, CONN.

In Casks, 400 to 800 pounds, at 5 cents per pound
In Kegs 100 to 200 " " 6 " " "
In Kegs less than 100 " " 7 " " "

C. L. GEROULD - THOMPSON, CONN.

What Advertisers Offer to Readers

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Western Gas Construction Co.

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Conveyors.
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Stacey Manufacturing Co., The.
Sullivan Brothers.

RUSSELL ENGINEERING COMPANY
SAINT LOUIS, MO.
COAL GAS BENCHES
COMPLETE COAL CARBONIZATION PLANTS

JOHN D. ORMROD, Pres. J. G. EBERLEIN, Sec'y & Treas.
EMAUS PIPE FOUNDRY
CAST IRON GAS & WATER PIPE
DONALDSON IRON CO.
EMAUS, PA.
Manufacturers of CAST IRON PIPE AND SPECIAL CASTINGS FOR WATER AND GAS, also FLANGE PIPE and FITTINGS for same.

WE SOLICIT YOUR INQUIRIES FOR EITHER
Silica or Fire Clay Benches
JAMES GARDNER, JR., COMPANY, BOLIVAR, PA.

JOHN DELL, *President and General Manager*
MISSOURI FIRE BRICK CO.,
ESTABLISHED 1882
— MANUFACTURERS OF —
Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.
We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One** *to* **Six Retorts.**
YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.
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S. Pemberton Hutchinson, President H. C. Adams, Vice-President George McCall, Treasurer C. B. Nichols, General Sales Agent
THE WESTMORELAND COAL COMPANY
CHARTERED 1854
Mines Situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.
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Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.
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For All Kinds of Pressure Reduction
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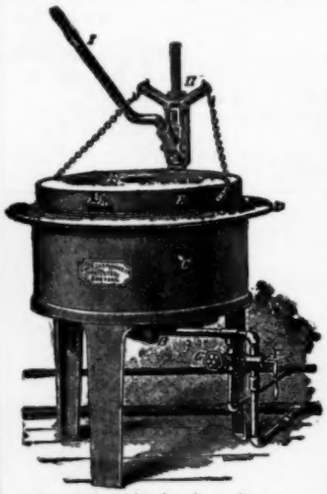

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If interested in the proper heat treating Appliance, consult us.

We are the Pioneers in the manufacture of Gas Blast Appliances and Heating Machines for the various Mechanical Heat-Treating Processes requiring PRECISION.

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Gas Engineers and Manufacturers

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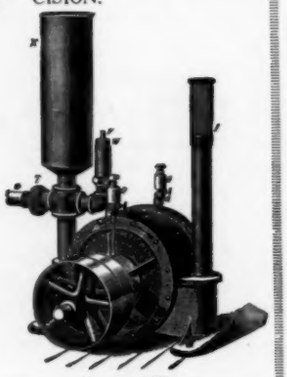

Pressure Blower

PUBLIC LIGHTING TABLE

MOONLIGHT SCHEDULE

JULY 1917

Day of Week	Date	Light		Extinguish
Sunday	1	1.00 A.M.		3.40 A.M.
Monday	2	2.00		3.40
Tuesday	3	No Lighting		No Lighting
Wednesday	4	No Lighting	F.M.	No Lighting
Thursday	5	No Lighting		No Lighting
Friday	6	8.00 P.M.		9.50 P.M.
Saturday	7	8.00		10.30
Sunday	8	8.00		11.00
Monday	9	8.00		11.20
Tuesday	10	8.00		11.50
Wednesday	11	8.00	L.Q.	12.20 A.M.
Thursday	12	8.00		1.00
Friday	13	8.00		1.40
Saturday	14	8.00		2.20
Sunday	15	8.00		3.50
Monday	16	8.00		3.50
Tuesday	17	8.00		3.50
Wednesday	18	8.00	N.M.	3.50
Thursday	19	8.00		3.50
Friday	20	8.00		3.50
Saturday	21	8.00		3.50
Sunday	22	7.50		3.50
Monday	23	8.20		3.50
Tuesday	24	8.40		3.50
Wednesday	25	9.10		3.50
Thursday	26	9.40	F. Q.	3.50
Friday	27	10.10		3.50
Saturday	28	10.50		3.50
Sunday	29	11.40		4.00
Monday	30	12.40 A.M.		4.00
Tuesday	31	1.50		4.00

What Advertisers Offer to Readers

See Index page 18 for Manufacturers' Advertisements of Products Listed here

United Gas Improvement Co.
Western Gas Construction Co.

Enrichers
See Oil.

Excavators
Parsons Co., The.

Exhausters
American Gas Furnace Co.
Connelly Iron Sponge & Gov. Co.
Connersville Blower Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Isbell-Porter Co.
Roots Co., P. H. & F. M.
Western Gas Construction Co.

Firebrick
Didier-March Co.
Gardner, Jr., Co., James.
Gas Machinery Co.
Gautier & Co., J. H.
Improved Equipment Co.
Maurer & Son, Henry.
Missouri Firebrick Co.
Parker Russell Mining & Manufacturing Co.
Russell Engineering Co.
Union Mining Co.

Fittings
See Pipe.

Fixtures
General Gas Light Co.
Pennsylvania Globe Gas Lt. Co.
Welsbach Street Ltg. Co. of Amer.
Welsbach Co.

Flue Gas Analysis Apparatus
Foxboro Co., Inc.

Furnaces—Gas
See Industrial Fuel.

Gas Analysis Apparatus
Foxboro Co., Inc.
Connelly Iron Sponge & Gov. Co.

Gas Irons
Crane Co., Wm. M.

Gas Plants, Complete
Davis & Farnum Mfg. Co.
Russell Engineering Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.

Gas Pumps & Boosters
Connersville Blower Co.
Roots Co., P. H. & F. M.

Gas Stoves
Crane Co., Wm., M.

Gauges

Pressure Recording
American Meter Co.
Brown Instrument Co.
Foxboro Co., Inc., The.
Helme & McIlhenny.
McDonald & Co., D.
Connelly Iron Sponge & Gov. Co.

Syphon
American Meter Co., Inc.

Governors
Chaplin-Fulton Mfg. Co.
Connelly Iron Sponge & Gov. Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.,
Helme & McIlhenny.
Isbell-Porter Co.
Pittsburgh Meter Co.
Reynolds Gas Regulator Co.
Sprague Meter Co.
Western Gas Construction Co.

Automatic
Connelly Iron Sponge & Gov. Co.

Fuel Gas
Connelly Iron Sponge & Gov. Co.

Heaters
General Gas Light Co.
See Ranges. Water Heaters.

Heating Machines
American Gas Furnace Co.

High Pressure Goods
American Gas Furnace Co.
See Governors.

Holders
Bartlett-Hayward Co.
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Delly & Fowler Mfg. Co.
Riter-Conley Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.
Wood & Co., R. D.

Hydrogen Gas Apparatus
Improved Equipment Co.
Western Gas Construction Co.
Foxboro Co., Inc.

Industrial Fuel Appliances
American Gas Furnace Co.
Surface Combustion Co.

Instruments

Recording
American Meter Co.
Brown Instrument Co.
Foxboro Co., Inc., The.

Iron Hydroxide
Iron Hydroxide Co.

Iron Sponge
Connelly Iron Sponge & Gov. Co.

Iron Work
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Riter-Conley Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.
Wood & Co., R. D.

Laboratories
Chemical Service Laboratories.
Electrical Testing Laboratories.

Lamps
Crane Co., Wm. M.
General Gas Light Co.
Miner, Thos. T. W.
Pennsylvania Globe Gas Light Co.
Welsbach Co.
Welsbach Street Lighting Co.

Lamp Posts
Donaldson Iron Co.
General Gas Light Co.
Miner, Thos. T. W.
Pennsylvania Globe Gas Light Co.
Welsbach Street Lighting Co.
Western Gas Construction Co.
Wood & Co., R. D.

Lead
United Lead Co.

Liquid Lever Gages
Foxboro Co., Inc.

Machinery
See Backfillers.
Charging Machinery.
Coal Gas Apparatus.
Conveyors.
Trench Machinery.
Water Gas Apparatus.

Mains
Sullivan Bros.
See Pipe. Lead.

Mantles
General Gas Light Co.
Miner, Thos. T. W.
Wiederhold Mantle & Burner Co.
Welsbach Street Ltg. Co. of Amer.
Welsbach Co.

Meters

Acetylene
Pittsburgh Meter Co.
Sprague Meter Co.

Air
Pittsburgh Meter Co.
United Gas Improvement Co.

Artificial Gas
Maryland Meter Works.

Complaint
Maryland Meter Works.

Dry
American Meter Co., Inc.

Locks
See Prepayment.

Natural Gas
Maryland Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Prepayment
American Meter Co., Inc.
Griffin & Co., John J.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co., D.
Pittsburgh Meter Co.
Sprague Meter Co.

Proportional
Pittsburgh Meter Co.

Regular
American Meter Co., Inc.
Griffin & Co., John J.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co.
Pittsburgh Meter Co.
Sprague Meter Co.

Station
American Meter Co., Inc.
Griffin & Co., John J.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co.

Steam
Gas Machinery Co.
United Gas Improvement Co.

—this industrial fuel branch of the gas business has ceased to be a promising possibility—it has become a huge concrete fact. Even the most complete and alert industrial department of any existing company is forced to admit that they have no more than scratched the surface of its powerful opportunities.

Throughout the country original and novel adaptations of gas to heating operations are being made in constantly increasing numbers. By its frequency of publication—52 times each year—the AMERICAN GAS ENGINEERING JOURNAL has earned the reputation of keeping pace with the rapid rate of progress in this field.

For your company's future, for your own future, for the future of the industry, have the JOURNAL, a practical industrial review, dropped on your desk each week. Make it **your own copy,** so you may file or clip those articles you wish to use.

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7-7

At last—a really useful book on Gas Works Operation and Management

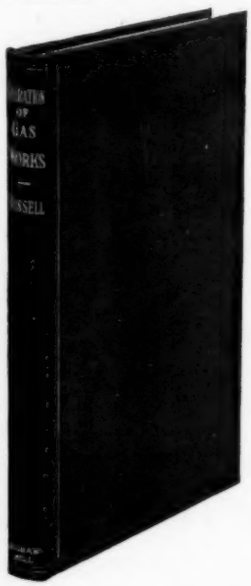
NOW READY

OPERATION OF GAS WORKS

By WALTER M. RUSSELL

Manager, Emporia Gas Company; Member American Gas Institute and National Commercial Gas Association

206 pages, 6 x 9,
76 illustrations,
$2.00 net, postpaid.



The details of gas works operation and management are treated in a concise and practical way in this book. It is the first to cover both coal and water gas manufacture from the standpoint of American practice.

The book has been written for the foreman, superintendent, engineer and others connected with small or medium sized gas works.

The author has had a broad, practical experience in the management of this class of works, and has been a close observer and student of the methods of other plants. He embodies in this book the results of this experience and study, confining himself strictly to methods which have been applied successfully on a commercial scale.

The fundamental aim of the work is to give the manager, superintendent and foreman a better understanding of the manufacturing problem as a whole, and to place at their disposal a knowledge of what others with problems similar to their own, are doing.

---CLIP THIS COUPON---

AMERICAN GAS ENGINEERING JOURNAL,
42 Pine Street, New York, N. Y.

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Name .....

Address .....

What Advertisers Offer to Readers

See Index page 18 for Manufacturers' Advertisements of Products Listed here

Western Gas Construction Co.

Test

American Meter Co., Inc.
Maryland Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Wet

American Meter Co., Inc.
Helme & McIlhenny.
Pittsburgh Meter Co.

Motion Recorder

Foxboro Co., Inc.

Outdoor Lighting Fixtures

See Street Lamps.
Lamp Posts.

Ovens

Gas

H. Koppers Co.
Gas Machinery Co.

Oxide

Iron

Henry Bower Chem. Mfg. Co.
Connelly Iron Sponge & Gov. Co.

Paints

Dixon Crucible Co., Jos.

Photometers

American Meter Co., Inc.

Plants—Complete

See Engineers—Contracting.

Pipe

Cast Iron Pipe Publicity Bureau.
American Cast Iron Pipe Co., The
Clow & Sons, James B.
Davis & Farnum Mfg. Co.
Donaldson Iron Co.
Glamorgan Pipe & Foundry Co.
Lynchburg Foundry Co.
Massillon Iron & Steel Co.
U. S. Cast Iron Pipe & Foundry Co.
Warren Foundry & Machine Co.
Wood & Co., R. D.

Laying

Sullivan Bros.
United Lead Co.

Vises

J. H. Williams & Co.

Columns

Cruse-Kemper Co.

Planemeter

Radial

Foxboro Co., Inc.

Plate

Metal

Stacey Mfg. Co.
Cruse-Kemper Co.,
Riter-Conley Co.

Prepayment Meters

See Meters.

Processes

See Coal Gas Apparatus.
Water Gas Apparatus.
Hydrogen Gas Apparatus.

Producer Gas Plants

Gas Machinery Co.
Western Gas Construction Co.
Wood & Co., R. D.

Provers—Meter

American Meter Co., Inc.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co., D.
Pittsburgh Meter Co.

Pumps

Drip

American Meter Co., Inc.
Connersville Blower Co.

Purifiers

Bartlett-Hayward Co.
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Isbell-Porter Co.
Parker-Russell Min. & Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The
United Gas Improvement Co.
Western Gas Construction Co.
Wood & Co., R. D.

Purifying Materials

Connelly Iron Sponge & Gov. Co.
Gas Machinery Co.
Iron Hydroxide Co.
Pennsylvania Salt Mfg. Co.
United Gas Improvement Co.
Western Gas Construction Co.

Purifier Trays

Connelly Iron Sponge & Gov. Co.
Davis & Farnum Mfg. Co.
Iron Hydroxide Co.
Western Gas Construction Co.

Pyrometers

Brown Instrument Co.
Foxboro Co., Inc., The.

Ranges—Gas

Crane Co., Wm. M.

Red Ore

Connelly Iron Sponge & Gov. Co.
Pennsylvania Mfg. Co.

Regulators

See Governors.

Retorts

Horizontal and Inclined

Didier-March Co.
Gardner, Jr., Co., James.
Gas Machinery Co.
Gautier & Co., J. H.
Improvement Equipment Co.
Isbell-Porter Co.
Maurer & Son, H.
Missouri Fire Brick Co.
Parker-Russell Mining & Manufacturing Co.
Russell Engineering Co.
Stacey Bros. Gas Constr. Co.
United Gas Improvement Co.

Silica & Clay

Gardner Co., James.
Gautier & Co., J. H.
Improved Equipment Co.
Parker-Russell Min. & Mfg. Co.
Russell Engineering Co.

Vertical

Isbell-Porter Co.
United Gas Improvement Co.

Rubber Goods

See also Bags.

Services

Sullivan Bros.
See also Pipe.

Scrubbers

See Purifiers.

Scrubber Trays

See Purifier Trays.

Specials

See Pipe.

Steel Construction

See Iron Work.

Stoking Machinery

See Charging Machinery.

Stoppers

Gas Main

Safety Gas Main Stopper Co.

Storage Tanks

See Holders.

Street Lamps

Miner, Thos. T. W.
Pa. Globe Gas Lt. Co.
Welsbach Street Lighting Co.

Structural Iron Work

See Iron Work.

Tachometers

Foxboro Co., Inc.

Tanks

Cruse-Kemper Co.
Bartlett-Hayward Co.
Stacey Mfg. Co.
Davis-Farnum Co.
Deily & Fowler Mfg. Co.
Wood & Co., R. D.
Riter-Conley Co.

Tar Extractors

See Coal Gas Apparatus.
Water Gas Apparatus.

Temperature Controlling Device

American Gas Furnace Co.
Foxboro Co., Inc.

Thermometers

American Meter Co.
Brown Instrument Co.
Connelly Iron Sponge & Gov. Co.
Foxboro Co., Inc., The.
Gas Machinery Co.

Time Recorder

Foxboro Co., Inc.

Tools

Connelly Iron Sponge & Gov. Co.,
J. H. Williams & Co.
Safety Gas Main Stopper Co.

Towers

Cruse-Kemper Co.

Trench Machinery

Parsons Co., The.

Valves

Bartlett-Hayward Co.
Connelly Iron Sponge & Gov. Co.

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(Continued)

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Gas Machinery Co.
Isbell-Porter Co.
Ludlow Valve Mfg. Co.
Roots Co., P. H. & F. M.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.
Wood & Co., R. D.

Back Pressure

Connelly Iron Sponge & Gov. Co.

Vertical Retorts

See Retorts.

Washers

See Purifiers.

Water Gas Apparatus

Bartlett-Hayward Co.
Connelly Iron Sponge & Gov. Co.
Davis-Farnum Co.
Didier-March Co.
Gas Machinery Co.
Isbell-Porter Co.
Stacey Manufacturing Co., The.
United Gas Improvement Co.
Western Gas Construction Co.

Water Gas Linings

Crane Co., Wm. M.
Russell Engineering Co.

Water Heaters

Crane & Co., Wm. M.
Russell Engineering Co.

Wrenches

J. H. Williams & Co.

No. 150 LAMP

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Globe Street Lamps
FOR
ALL KINDS OF GAS OR BURNERS
Lamp Posts, Cocks and Burners
Everything Necessary for
STREET LIGHTING

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If you are interested in street or park lighting, we want to send you our catalog and prices

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For Increased Capacity under Slow Speed Operation

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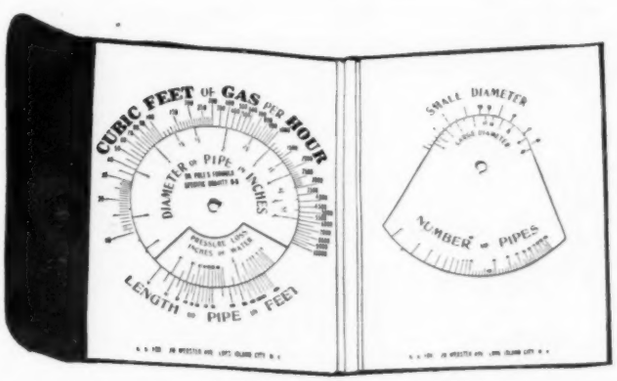
Baltimore, Md.

N. W. Representative—Northwest Gas Equipment Co., 1010 Spalding Building, Portland, Ore.



Fox Gas Flow Computer

For Superintendents, Salesmen, Foremen and Fitters

TO DETERMINE THE PROPER SIZE OF PIPE TO SPECIFY OR INSTALL AS RUNNING LINES, SERVICES, AND FOR CONNECTIONS TO APPLIANCES AND METERS.

The "Gas Flow" Computer on the left of the folder has the following ranges:

Cu. ft. of gas per hour.....from 10 to 10,000 cu. ft.
Diameter of pipe.....from ⅜ to 6 inches.
Length of pipe.....from 10 to 1,000 feet.
Pressure loss.....from 0.01 to 1 in. water.
Specific Gravity—0.6.

The Computer on right of the folder affords a rapid means of determining the number of pipes that can be taken from one of a larger diameter, and haye an equivalent capacity. It also can be used to determine the size of pipe necessary to supply a number of small pipes of the same, or varied diameters. It may be used to design headers for meters and appliances, when the distances between the outlets are small enough to make the loss of pressure negligible.

The Computer is issued in pocket size, mounted in a neatly bound folder, measuring 4½ inches by 6 inches, containing an insert page of directions.

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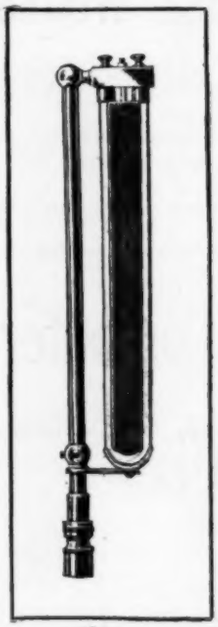

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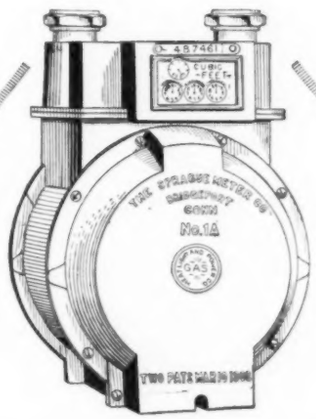
ALBANY, N. Y.



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For Measurement of Artificial Gas

Costs Less

Per cubic-foot capacity than any other meter

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Los Angeles, 631 So. Spring St. — Columbia, S. C., 1433 Main St.

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Birmingham—American Trust Building
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